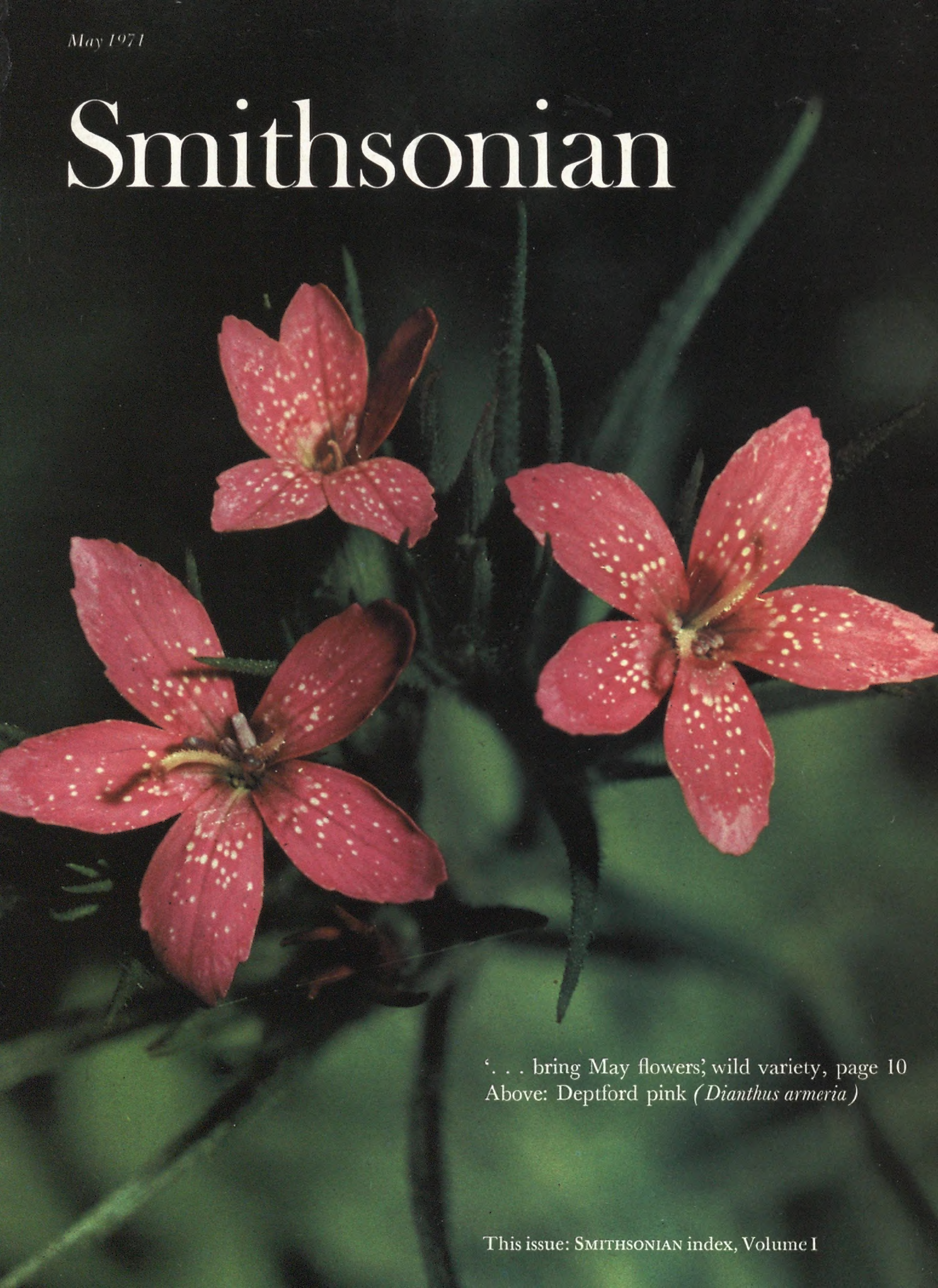
May 1971

Smithsonian



'. . . bring May flowers,' wild variety, page 10
Above: Deptford pink *(Dianthus armeria)*

This issue: SMITHSONIAN index, Volume I

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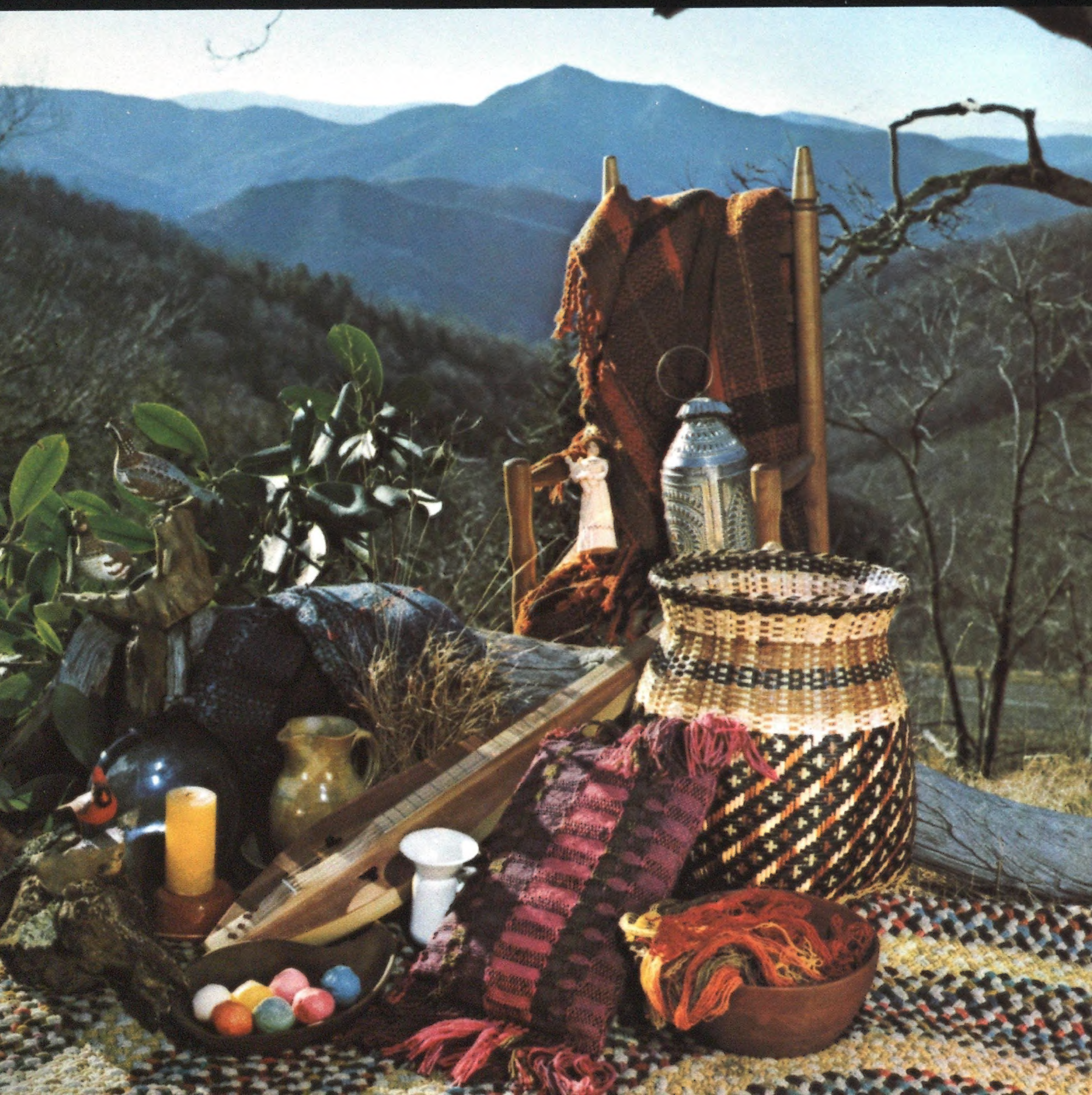

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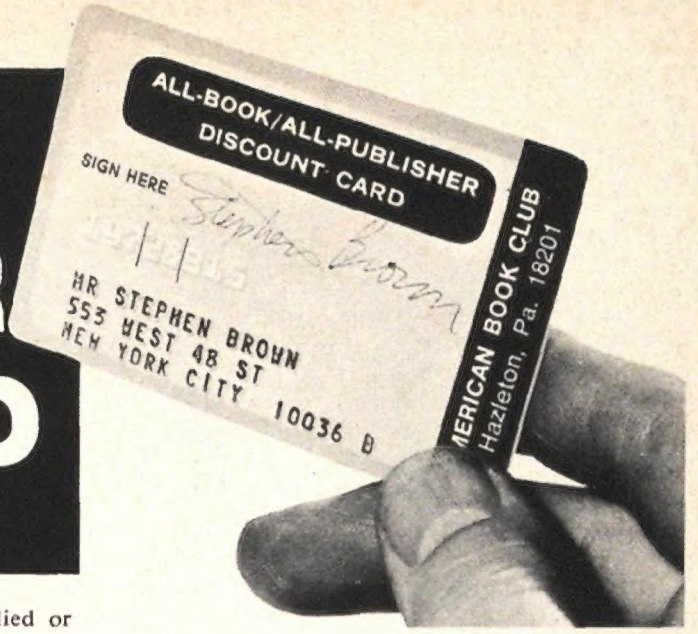

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May 1971

Smithsonian

Volume 2, Number 2

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By Patrick Ryan

The view from the castle

As the line between basic and applied research grows less distinct, the requirement for humane goals in science grows more obvious

Basic research has long been one of the principal objectives of the Smithsonian—but what is basic research? Indeed the distinction between basic and applied science is a relatively recent consideration.

In the first efforts at scientific research in the United States, men who were often self-taught—like Benjamin Franklin and Mineralogist Adam Seybert—performed experiments in their own houses or backyards. Whether they sought different source materials for making gun powder or tried to chart the conductivity of electricity, their research did not necessarily imply immediate goals or obtainable objectives.

Prior to the middle of the 19th century, the commercial application of a newly invented machine might be 100 years off in the future. Such "practical" research could hardly be described as applied if the researcher could reap no possible benefit or see it used during his lifetime.

In the 19th century, a corporate pattern gradually formed around inventions and new technology and this by now has led to an entirely new culture and a wholly new way of looking at *all* scientific research. Nowadays, research is most often performed by teams of scientists. New techniques and machines arise arithmetically; new recombinations of techniques and machines rise exponentially.

Today applied research dominates. Whether organized to solve massive problems with combinations of supermachines like computers and space equipment, or conducted by multidisciplinary teams of scientists performing single segments of experiments which lead cumulatively to biomedical breakthroughs, most research is applied.

Where is the lonely scientist working in his homemade laboratory today? Almost nowhere. Now even basic research—science for the sake "only" of knowledge—is most often done by a laboratory team.

It was hard even to foresee the term "applied research" 150 years ago; now the distinction between basic and applied is becoming blurred. For instance, the work done in the Smithsonian's Museum of Natural History laboratories is strictly defined as *basic*. Yet marine biologists concerned with invertebrates find themselves summoned into action to solve the problem of a mysterious population explosion of reef-eating starfish, the "crown-of-thorns," (SMITHSONIAN, April 1970) whose life history may (or may not) prove to be harmful to the buttress reefs of tropical coral islands. Geologists may become embroiled with the disposition of solid wastes; students of solar radiation may have to discuss supersonic aircraft.

So be it. All basic research has an applied utility for man sooner or later, and we are merely deceiving ourselves if we assume otherwise. Every piece of research, every grain of knowledge ultimately fills its place in the grand design of knowledge and truth.

Today universities and kindred institutions like our own are at a crossroads. Research may be "basic" and therefore a source of personal pride to the individual academic, but it must also be part of a long-range or short-range attempt to alleviate the human condition. It must be part of a recognized set of priorities, carefully sorted out, explained and followed for valid, socially significant reasons.

S. Dillon Ripley

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Letters to the Editor

Dear SMITHSONIAN reader:

As can be seen from the index on pp. 72-80 SMITHSONIAN had a full first year and we are grateful to you for your support.

The worst growing pains occurred in the subscription service area. We feel strongly that we must do better and we are changing our system.

To those of you whose service started late, who were billed for subscriptions you did not receive or had already paid for or who have other complaints, our apologies. We solicit letters to be sent to me, c/o SMITHSONIAN, 420 Lexington Avenue, New York, N.Y. 10017.

Anne Keating

Anne Keating
Circulation Director, National Associates

Sea otters

Dear Sir: Your splendid article on the sea otter by Hal Roth in the March issue points up a fine distinction between the charm of the otter and a monstrous chapter of man's activities. Rocking her pup in the waves—shading her eyes with her small paws—using kelp as a cord and rocks as an anvil, her ingenuity and appeal are a marked contrast (one might say) to the fur traders' vicious slaughter with its accompanying black history of greed and violence.

Although the sea otter's survival is a victory, it is faced with an increasingly hostile environment.

Along with pollutions and potential oil spills, propellers lacerate the rafting herds and shots are fired from fishing boats. The unwillingness of some men to share the abalone resource with the otter has triggered the formation of a group to guard the welfare of this remarkable animal. Your readers who are interested should write to:

FRIENDS OF THE SEA OTTER
Big Sur, California 93920

We will share our otter news, our research reports and our photography in our efforts to hold to conservation principles for its survival.

Margaret Owings
Big Sur, California

Ocean farming

Dear Sir: Just after reading your provocative article on ocean farming by Lord Ritchie-Calder, I learned of a real breakthrough in this field. The Oceanic Institute in Hawaii has, for the first time, suc-

Continued on page 8

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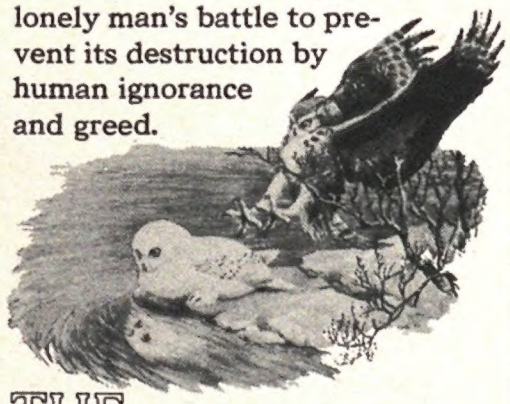

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Pat Tucker
Washington, D.C.

LSD

Dear Sir: The letter by Everett C. Sweet in the March issue speaks of hysteria relative to chromosome damage.

Some chromosome "damage" leads to mutations. Some mutations are beneficial. Is it not possible that some of the forces extant today, such as drug abuse and pollution damage, can shake us out of our present static stage in the evolutionary scheme—to the great benefit of the world if not to *Homo sapiens.*
J.R. Rafter
Providence, Rhode Island
Mr. Sweet was referring to the author's statement that many scientists felt the chromosome damage from LSD had been misunderstood and exaggerated. Ed.

Conservation

Dear Sir: In the story of conservation, the photograph of nine smug-looking men dwarfed by the stump of one freshly cut sequoia indicates we have evolved into a large species of termite.
Peter R. Margolin
Mountain View, California

Dear Sir: In publishing photographs such as those of the stump of a huge redwood tree and a game hog beside 177 killed ducks, why not stress the feelings of sorrow or contempt such scenes call up? When a picture depicts a damnable circumstance, why not say so?
Roi Partridge
Oakland, California
The pictures speak for themselves and it would have been redundant to say what was evident. The tone of the whole article indicates how SMITHSONIAN *feels.* Ed.

Eugenie Clark

Dear Sir: Your article concerning Dr. Clark's work with sharks and eels mentions an apparent puzzle with respect to the cow-nosed ray. The article mentions the ray tends to school with no apparent physiological reason and goes on to explain that the stomachs of the schooling

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To Museum Lovers:

by S. Dillon Ripley

A collection of essays by the Secretary of the Smithsonian Institution which recounts how museums came to be, what they are today and what they can and should be.

Mr. Ripley writes as a professional and as a lover of museums, how important they are to the educational and cultural life of a community.

The ideal museum is not merely a storehouse but an activist force whose central task is to depict the impact of man on his environment and the impact of the environment on man.

Mr. Ripley points out while education is serious and perhaps not fun, museums are educational, and are *fun.*

At bookstores $5.00

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rays "were generally found to be empty."

This would seem to point to a different conclusion than that given in your article, namely that feeding or hunting could not be ruled out as a cause for schooling behavior. That is, one would not expect animals with full stomachs to be feeding or hunting, rather one would expect their stomachs generally to be empty.

It is probably pointless to say, after such nit-picking, that your magazine is enjoyed by our family (especially myself) —but it is. Now you've gotten me curious about cow-nosed rays.

Page Brown
Harlem, Montana

Dr. Clark explains that the rays school in massive numbers for an extended period, during which their feeding activity seems normal. In other words, they are not engaged in any mass feeding orgy; often their stomachs are empty. The reason for their schooling, therefore, remains a puzzle still being investigated. Ed.

Tattoos

Dear Sir: Patrick Ryan's article on tattoos indicates, correctly, that "there are current signs that tattooing is heading for a renaissance." The final paragraph of the article indicates that "it might be a good investment to wear such a tapestry."

I would strongly caution any prospective subject for "dermal decoration" against such a procedure. There are at least three valid reasons against it, namely: the danger of transmission of bacterial infections, viral hepatitis or syphilis, resulting from use of improperly sterilized tattooing needles.

Should the subject wish to be tattooed anyway, he might gain some comfort from the fact that the tattoo can be removed at a later date, not by the laser method as indicated in the article, but by a better method called "dermabrasion," which entails the use of fraises or wire brushes to scrape off the surface layers of the skin in the hope that the pigment particles will come out.

No method of removal produces a smooth site devoid of scarring.

A.J. Orfuss, M.D.
New York, New York

Mr. Ryan, of course, was writing in his role as a scientist-humorist, although his facts were thoroughly checked. SMITHSONIAN *is grateful to Dr. Orfuss for the additional information.* Ed.

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By Charlton Ogburn

The wildflowers of spring again touch the land with hope

May blossoms in color, both gaudy and delicate, still find quiet spots where they brighten our hearts

If you live in the country, you know even before daybreak that the season has changed: A whippoorwill calls. With the paling of the sky the bell fluting of the first wood thrush is heard, and the stuttering, spilling over of the first house wren's singing. The dogwood's blossoms are half formed, the apple trees' pink buds are opening into white flowers. A week ago it was basically winter. Now the height of the spring flowering is at hand.

It is to this that the earth has been moving for weeks, since the morning that brought the sound of rain dripping from the eaves—wonderful to awaken to when it betokens the passing of a long northern winter. Days of frigid, merciless northwesters, the March winds that rampage into April, were still ahead—winds easier to bear, however, in the knowledge that they result in part from the warming of lower latitudes and of the thermal updrafts thus created. Removal of snow tires would have been premature. All the same, spring was in the air—loveliest of phrases! And the narcotic breezes of the south would return more and more frequently and persist longer.

Spring beauty *(Claytonia virginica)* may arrive in March and sometimes blooms as late as July. (Shown here 4 X life size)

Photographs by Francis M. Greenwell

True forget-me-not *(Myosotis scorpioides)* like most wildflowers is hard to find. It echoes the cry of a lover, drowning as he picked them for his lass.

Forget-me-nots symbolize true love. These are more than life size; those at left are less.

Northern blue violet *(Viola septentrionalis)* adorns open woods. Ancient Romans made a perfumed wine out of these blooms. (2 X life size)

Early saxifrage *(Saxifraga virginiensis)* often grows among rocks and was believed to split them—its name means "stone-breaking." (4 X life size)

Pink lady's slipper *(Cypripedium acaule)* or moccasin flower belongs to the orchid family and was once more common on the East Coast. (Larger than life size)

Before the ice was off the bog the skunk cabbage thrust up the open-fronted cap housing its little dome of flowers, a green shell marked with purplish brown. This was the beginning—this, and the furry moth on the window of a mild evening, and the wild, drawn-out scream of the red-shouldered hawk diving past its mate. Hard behind came the exultant singing of red-winged blackbirds, the eager chorus of peepers, the tassel-like flowers of red maples.

The tide of returning life presses close to winter's heels. To neglect no advantage, to steal every march possible on competitor and enemy, is the key to success among living things. That trees may come to life again at the very earliest it is safe to do so, the sap has long since arisen in them; the tapping of maples for syrup begins in mid-February. But until the danger of severe frosts has largely passed, few plants put out flowers other than the early trees (the flowers of which are hardly recognized as such except by connoisseurs) and a few perennials: the skunk cabbage, the little parsley known as harbinger-of-spring and those that man cultivates—snowdrops, crocuses, daffodils, jasmine and forsythia.

The period of the native spring flowers corresponds with that of the foliation of trees and shrubs. It commences when the hardiest tree leaf-buds are just venturing to open and trails off when leafing-out is completed. It thus coincides roughly with the migration of warblers and their fellow travelers. The insects that make up their diet depend on vegetation for their own.

Look for trout lilies, bloodroot and saxifrage at

Rue anemone *(Anemonella thalictroides)* heralds early spring when it appears in open woodlands. White "petals" are really sepals. (2 X life size)

Mr. Ogburn, a nature writer, is famous for his John Burroughs Medal-winning book, The Winter Beach. *Mr. Greenwell of the Smithsonian Museum of Natural History took these pictures east of the Rockies*

Birdfoot violet *(Viola pedata)* gets its name from the shape of its leaves. This bicolored variety grows in moist, open woods. (3 X life)

Smooth yellow violet *(Viola pensylvanica)* contrasts with its cousin at left. It is found in cool, shaded rocky slopes. (3 X life)

Dutchman's-breeches *(Dicentra cucullaria)* resembles baggy pantaloons, upside down. The plant grows about six inches tall in rich woods. (2 X life size)

Bellwort *(Uvularia perfoliata)* or merrybells can be found in late spring. (Larger than life)

Wake-robin or toadshade *(Trillium sessile)* is one of many trilliums. Their leaves, petals and sepals grow in whorls of three. (2 X life size)

about the time pine and yellow palm warblers, ruby-crowned kinglets and blue-headed vireos appear, when the ornamental cherries are clouds of bloom, the grass has become lush almost overnight and you first hear above the rushing stream the briefly ecstatic outpouring of the Louisiana waterthrush. With the flood of blackpoll warblers six weeks or so later, when the countryside is sibilant with their lisping "tss-tss-TSS-TSS-tss-tss", rue and wood anemones, Dutchman's-breeches and bluets are beginning to wane, though some spring bloomers, like columbine, showy orchis and spiderwort, will continue into summer.

Plants begin their life processes as soon as the weather is trustworthy and carry on as far as possible before the forest canopy seals out all but transient beams of sunlight. Native spring flowers are typically of woodland growth. Woodland flowers are typical of our original flora. Apart from shores, marshes, rocky elevations and burned-over areas, the eastern half of the continent before human settlement lay under mostly unbroken forest. Only plants adapted to its shadowy aisles could thrive.

What brings a score of violet plants around my house or a whole bed of lady's slippers on a wooded hillside into bloom within two days of one another? What biological clock operates in the dark ground? How can earth, air and water be transformed into the lady's slipper's pink-veined rosy envelope and the bluet's azure corolla? How account for such creative artistry inexhaustibly exemplified in the variety of flowers? Is such beauty, in such diversity of form, really necessary for practical purposes?

Science takes the annual floral outburst in stride. Yet if there had never been flowers, with what leaping hearts should we behold the unfolding of these living gems of fragile beauty exquisite in symmetry, encompassing all nature's palette in their pure colors! As it

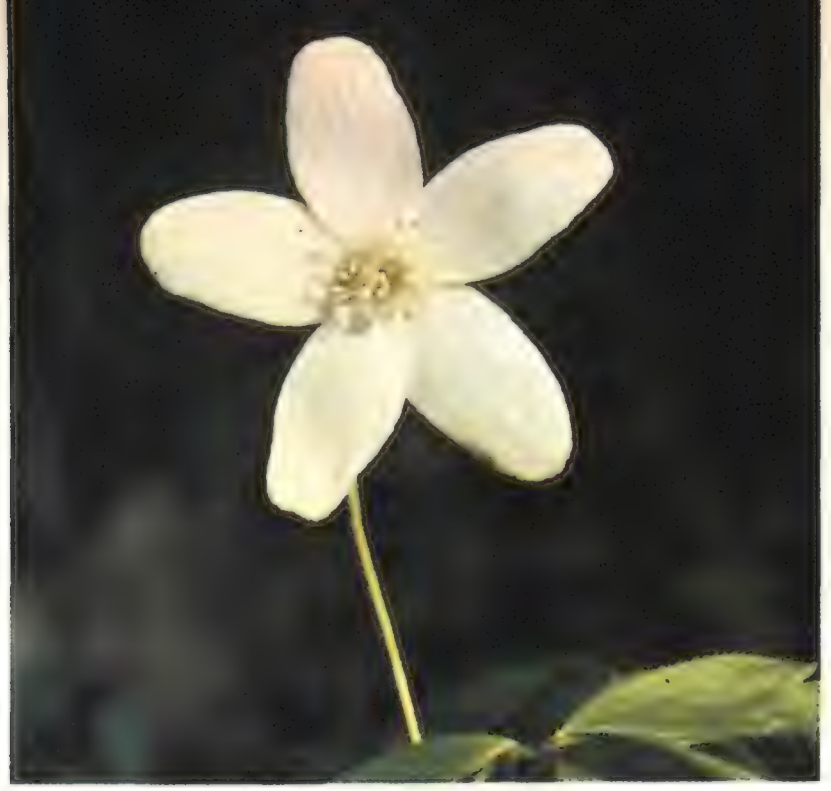
Bloodroot *(Sanguinaria canadensis)* gets its name from orange-red fluid that oozes from its broken stem. Indians used it for face paint. (Less than 2 X life size)

Trout lily *(Erythronium americanum)* is often called dogtooth violet. It pokes through the ground early, before leaves rob it of sunlight. (2 X life size)

Bluets *(Houstonia caerulea)* are a familiar sight on fields and roadsides. They are shown here life size.

Wild geranium *(Geranium maculatum)* grows in woods and shady roadsides. Its other name, spotted cranesbill, describes shape of fruit. (2 X life size)

Jack-in-the-pulpit *(Arisaema triphyllum)* resembles preacher in pulpit. Indians boiled and ate roots and the plant is often called Indian turnip. (Life size)



Wood anemone *(Anemone quinquefolia)* was said by Greeks to have sprung from Aphrodite's tears, shed for the death of Adonis. (2 X life size)

is, at least once in spring we should bend down to examine close up, as if they were indeed new to mortal eyes, their subtle and harmonious architecture: wild geranium, birdfoot violets, the columbine—a miniature, compound rocket just turned earthward at the peak of its trajectory, glowing as if heated.

Flowers have the advantage over birds of being totally approachable. However, the more beautiful a thing, the keener our desire to possess it. But picking a wild flower yields only faded tissue in a matter of a day or two, and transplanting it, in the long run, generally serves no more purpose. The only reliable way to possess its beauty is on canvas or film (as in these pages) or in memory.

Carpeted with flowers—the expression is conventional hyperbole. But it is not wide of the mark of sylvan bottomlands when the medley of bird songs is at its height. The unfurled umbrellas of mayapples form little ponds of green. For a hundred feet you may be unable to take a step lest you crush the blood-marked lance leaves of trout lilies among which little yellow lamps of flowers beam their radiance on the ground. The clouds move off and, responsive to sunlight, a host of sensitive spring beauties open their small white or flushed, pink-lined star-blossoms. Virginia bluebells holding up their clusters of trumpets matching the May sky, crowd the banks of streams.

In the woods, only spring brings such spectacles. Summer will see other flowers, but these often grow as scattered individuals, not in whole gardens. And the massing of these lovely, lively blossoms that seem to have traipsed forth like a carefree throng, redeeming the dour landscape of winter's leaving, does no less for one's interior landscape. The spectacle almost persuades one that gladness is an integral part of life and an essential message of the cosmos and, come what may, has its hour.

Venus' looking-glass *(Specularia perfoliata)* is named for its flattish, polished seeds. It grows like a weed in sterile clearings. (4 X life size)

Virginia bluebells *(Mertensia virginica)* are also called Virginia cowslip. Pink flowers are young. They turn blue with age. (3 X life size)

Star grass *(Hypoxis hirsuta)*, of Amaryllis family, looks like a grass as it grows in open woods. (2 X life)

Pink azalea *(Rhododendron nudiflorum)*, or pinxter flower, blooms gloriously in woods and swamps as a signal for warm weather to arrive. (2 X life size)

Showy orchis *(Orchis spectabilis)* is an exciting find—a wild orchid. Many orchids have thickened roots which served as medicine. (2 X life size)

Harbinger-of-spring *(Erigenia bulbosa)* is one of the earliest flowers to appear in springtime. (2 X life size)

Golden star *(Chrysogonum virginianum)* often eludes the eye in dense woods. Many fellow members of the daisy family prefer meadows. (More than 2 X life)

Common spiderwort *(Tradescantia virginiana)* appears along roadsides, edges of woods— and sometimes in salads. (Larger than 2 X life)

Wild ginger *(Asarum canadense)* is not the true ginger but root serves as spice. It often blooms under damp leaves where insects pollinate it. (4 X life)

Columbine *(Aquilegia canadensis)* overpicked on its rocky hillsides, is getting rare. Species of this family grow all over the world. (5 X life size)

By Ralph S. Solecki

Neanderthal is not an epithet but a worthy ancestor

As research continues on some prehuman remains from Iraq's Shanidar Cave, the Neanderthals seem closer to us in spirit

The top of a skull was perched on the edge of the yawning excavation in the huge cavern. At first it was difficult to realize that we had before us an extreme rarity in human paleontology.

Except for its heavy brow ridge, the skullcap looked like a gigantic egg, soiled and broken. When fully exposed on the narrow excavation shelf, it was an awesome sight—obviously the head of a person who had suffered a sudden, violent end. The bashed-in skull, the displaced lower jaw and the unnatural twist of the head were mute evidence of a horrible death.

As we exposed the skeleton which lay under a heavy burden of stones, we had confirmation that this individual had been killed on the spot by a rockfall. His bones were broken, sheared and crushed on the underlying stones. A large number of rocks must have fallen on him within a split second, throwing his body backward, full-length down the slight slope while at the same time a block of stone severed his head and neck from his trunk.

Among his remains there were small concentrations of mammal bones, which might have been rodent nests. But it is equally possible these bones were dropped there as part of a funeral feast for the dead.

This was "Nandy," as we called him, a member of the species *Homo neanderthalensis* who had died about 48,000 years before. In the scientific literature he is referred to as Shanidar I, because his were the first adult human remains that we identified as Neanderthal from a cave near the village of Shanidar high in the mountains of Kurdistan in northern Iraq.

Large, airy, and conveniently near a water supply, Shanidar Cave is still a seasonal home for modern Kurdish tribesmen, as it has been for various groups of men for thousands upon thousands of years. I had led our expedition to Shanidar Cave in a search for cultural artifacts from the Old Stone Age in this part of Kurdistan, Iraq. Human remains, much less Neanderthal remains, were not the goal, yet altogether in four expeditions from 1951 to 1960 we uncovered nine Neanderthal skeletons.

Laboratory studies of these remains continue to this day and the results are bringing the Neanderthals closer to us in spirit and mind than we would ever have thought likely.

The Neanderthals have been a nettling problem ever since the first find was made more than 100 years ago. This was the famous faceless skull and other skeletal parts found during quarrying operations around a cave in the Neander Valley not far from Düsseldorf in Germany. Primarily through the writings of one man, Marcellin Boule, who was a greatly respected Frenchman in the field of human paleontology, the owner of the Neander skull was soon cast in the role of a brutish figure, slow, dull and bereft of sentiment.

Although we now know much more about Neanderthal man—there have been at least 155 individuals uncovered in 68 sites in Europe, the Near East and elsewhere—he still seems to hang in space on the tree of human evolution. Some anthropologists feel that he had reached a "dead-end" branch on this tree. In any case, his time span on Earth (about 80,000 years) was more than double that of modern man who replaced him, but roughly one-tenth of the time span of *Homo erectus* who preceded him.

An abundance of Neanderthals

The classical hypothesis, now abandoned, was that Neanderthal man was an ancestral stage through which *Homo sapiens* passed. A second theory is that Neanderthal man was a species apart from *Homo sapiens,* contemporary but reproductively isolated, as donkeys are from horses. The third is that Neanderthal man was a subspecies of early *sapiens,* forming a geographic race. On the whole, the evidence appears to indicate that the Neanderthal did not gradually change into *sapiens,* but was replaced by invading *sapiens.* The greatest difficulty for human paleontologists is that there is a real scarcity of skeletal finds to

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This article is adapted from his book, Shanidar, *to be published in June by Alfred A. Knopf.*

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Name: unknown. Alias: Shanidar I (Nandy). Cause of death: rockfall. Place: Shanidar Cave, Iraq.
Date of death: 46,000 B.C. Nearest relative: Man.

which they can point with confidence as *sapiens* of an age comparable to that of the Neanderthals.

There was, however, no scarcity of Neanderthals at Shanidar Cave. Prior to the discovery of Nandy, or Shanidar I, we had recovered the remains of an infant. It was later identified as Neanderthal by our Turkish colleague, Dr. Muzaffer Senyürek of the University of Ankara. When it was found, we had little reason to suspect that it was a Neanderthal child.

But not so with Nandy. "A Neanderthal if I ever saw one," is the comment in my field notes for the day of April 27, 1957, the day we found him. Although he was born into a savage and brutal environment, Nandy provides proof that his people were not lacking in compassion.

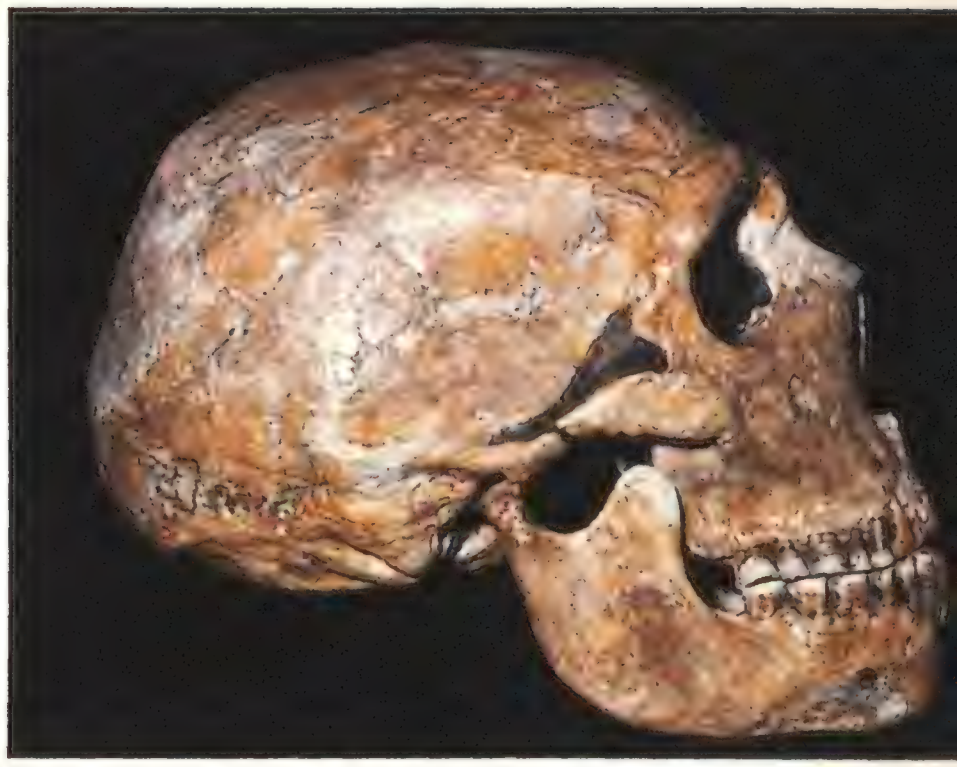
According to the findings of T. Dale Stewart, the Smithsonian Institution physical anthropologist who has studied all the remains of the Shanidar Neanderthals (except for the Shanidar child), Shanidar I lived for 40 years, a very old man for a Neanderthal—equivalent to a man of about 80 today. He was a prime example of rehabilitation. His right shoulder blade, collar bone and upper arm bone were undeveloped from birth. Stewart believes that his useless right arm was amputated early in life just above the elbow. Moreover, he must have been blind in his left eye since he had extensive bone scar tissue on the left side of his face. And as if this was not enough, the top right side of his head had received some damage which had healed before the time of his death.

In short, Shanidar I was at a distinct disadvantage in an environment where even men in the best condition had a hard time. That Nandy made himself useful around the hearth (two hearths were found close to him) is evidenced by his unusually worn front teeth. Presumably, in lieu of his right arm, he used his jaws for grasping. But he could barely forage and fend for himself, and we must assume that he was accepted and supported by his people up to the day he died. The stone heap we found over his skeleton and the nearby mammal food remains show that even in death he was an object of some esteem, if not respect, born of close association against a hostile environment.

The discovery of Shanidar I was for us a major, and unexpected, event. The discovery, about a month later on May 23, of Shanidar II was overwhelming.

The initial exposure was made by Phil Smith, then a Harvard University graduate student, who laid bare the great eye sockets and broken face of a new Neanderthal. My first impression was of the horror a rockfall could do to a man's face. The lower jaw was broken, the mouth agape. The eye sockets, crushed out of shape by the stones, stared hollowly from under a warped heavy brow ridge, behind which was the characteristic slanting brow of the Neanderthal.

From later reconstruction of the event, we determined that Shanidar II was killed by a relatively minor rockfall, followed closely by a major rockfall that missed the dead man. His demise did not go unnoticed by his companions. Sometime after the tu-



On this reconstructed skull of Shanidar I, one could equally well fashion "the features of a chimpanzee or the lineaments of a philosopher."

The crushed skeleton of Shanidar I as it was found by the author. Its severed skull had rested on the light rock at the right.

mult, thunder and subsiding dust of the crashing rocks, they returned to see what had happened to their cave mate. It looks as though a small collection of stones was placed over the body and a large fire lit above it. In the hearth we found several stone points, and several split and broken mammal bones nearby that may have been the remains of a funeral feast. It appears that, when the ceremony was at an end, the hearth was covered over with soil while the fire was still burning.

As with the first two adults, Shanidar III was found in the course of cleaning and straightening the profile of an excavation. It was as if some Near Eastern genie was testing my alertness by tucking away the skeletons on the borders of the excavation proper.

Like the other two, Shanidar III had been accidentally caught under a rockfall and instantly killed. One of his ribs had a strange cut. X rays taken at Georgetown University Hospital revealed that he had been wounded by a rectangular-edged implement of wood and the wound had been in the process of healing for about a week when he died. Most likely, he had been disabled in a conflict with unfriendly neighbors and was recuperating when he was killed. Clearly, the dangers of the caveman's life were by no means shut out when he crossed the portal to his airy home.

On August 3, 1960, during our fourth and last season at Shanidar, we uncovered the fragile and rotted bones of Shanidar IV. While Stewart exposed these remains, I started to explore the stones and soil near the place where three years before we had found Shanidar III. Parts of his skeleton were missing and unaccounted for in our collection.

In my first trowelings, several animal bones turned up. One did not look like an animal bone; it looked human. Later I encountered a rib bone that Stewart authenticated as human, but it was not until I uncovered a human molar tooth that we confirmed the presence of Shanidar V. This was becoming too much.

Within four days we found several other bones of this fifth Neanderthal including the scattered fragments of the skull. It appeared that he too was killed by a rockfall, perhaps the same one that killed Nandy.

There was yet another discovery to be made. Stewart was clearing around the southern side of Shanidar IV when he encountered some crushed pieces of a

humerus near the skull. "It doesn't make sense," said Stewart, "not in anatomical position." His immediate reaction was that he hated to think that there was yet another Neanderthal in the cave. Furthermore, there were already two humeri for Shanidar IV, the correct number, and now a third: Here was Shanidar VI.

In the space of only five days we had discovered three Neanderthal skeletal groups. Before us were the vast problems of preserving, recording and transporting the remains safely to the Iraq Museum in Baghdad. In the course of feverishly carrying out these activities, we discovered—in some loose material associated with Shanidar VI—more bones which later proved to be from yet another Neanderthal, Shanidar VII. These two, VI and VII, were females. We also retrieved some bones of a baby.

The skeleton remains of IV (a male), VI, VII and the baby (VIII) all appeared to lie in a niche bounded on two sides by large stone blocks. The nature of the soft soil and the position of the stone blocks leads me to believe that a crypt had been scooped out among the rocks and that the four individuals had been interred and covered over with earth. The child had been laid in first; the two females next, perhaps at a later time. The remains of these three were incomplete. Shanidar IV, the adult male, received the main attention of the burial. Probably, to make room for Shanidar IV, the bones of the others were disturbed.

As part of the archaeological routine, I had taken soil samples from around and within the area of Shanidar IV and Shanidar VI, as well as some samples from outside the area of the skeletal remains. These were sent for pollen analysis to Mme. Arlette Leroi-Gourhan, a paleobotanist in Paris.

Under the microscope, several of the prepared slides showed not only the usual kinds of pollen from trees and grasses, but also pollen from flowers. Mme. Leroi-Gourhan found clusters of flower pollen from at least eight species of flowers—mainly small, brightly colored varieties. They were probably woven into the branches of a pine-like shrub, evidence of which was also found in the soil. No accident of nature could have deposited such remains so deep in the cave. Shanidar IV had been buried with flowers.

Someone in the Last Ice Age must have ranged the mountainside in the mournful task of collecting flowers for the dead. Here were the first "Flower People," a discovery unprecedented in archaeology. It seems logical to us today that pretty things like flowers should be placed with the cherished dead, but to find flowers in a Neanderthal burial that took place about 60,000 years ago is another matter and makes all the more piquant our curiosity about these people.

Regarding their livelihood, we can certainly say the Neanderthals of Shanidar were hunters/foragers/gatherers. They most likely made a seasonal round of their wilderness domain, returning to shelter in Shanidar Cave.

The animals they hunted are represented in the cave by the bones of wild goat, sheep, cattle, pig and land tortoise. More rare are bear, deer, fox, marten and gerbil. It should be noted that the most common animals represented are the more docile type, the gregarious herbivorous mammals. It is likely that the Neanderthals caught them by running them over cliffs in herds or, conceivably, by running them into blind canyons where they could be slaughtered. There are several such canyons within easy striking distance of Shanidar Cave.

Communal life in a cultural backwater

The picture of the lone stalker cannot be ruled out in the case of the Neanderthal but, since these people lived in a communal setting, it would be more natural for them to have engaged in communal hunting. And the fact that their lame and disabled (Shanidar I and Shanidar III) had been cared for in the cave is excellent testimony for communal living and cooperation.

By projecting carbon 14 dates that we have received for certain portions of the cave, I estimate that its first occupation was at most about 100,000 years ago. For perhaps 2,000 generations, over a period of some 60,000 years, we think that groups of Neanderthals—probably numbering 25 members at a time—made their seasonal home in Shanidar Cave. Preliminary findings from the analysis of pollen samples show that, through the long history of their occupation of the cave, the climate vacillated from cool to warm.

Yet throughout the period, the Neanderthals changed little in their means of adapting to these climatic changes. Their tool kit remained much the

Shanidar IV died 60,000 years ago. He was esteemed by his Neanderthal mates who buried him with care—and with flowers.

same throughout: It included their flaked stone tools identified as a "typical Mousterian" industry of points, knives, scoopers and some perforators, all struck off from locally derived flint pebbles. Only a few fragments of bone tools were found. With this meager tool kit Neanderthal man was able to survive and prosper in his own way.

Shanidar seems to have been a kind of cultural backwater, a "refuge" area bypassed by the stream of history because of the remoteness of the area—a condition still reflected in the Kurdish tribal compartmentalizations of today.

Then, around 40,000-35,000 B.C., the Neanderthals were gone from Shanidar Cave, replaced by a wave of *Homo sapiens* whom we have called Baradostians. We have no skeletal remains of these people but ample evidence that they possessed a brand new stone tool kit. Using the same raw materials available to their predecessors, the Baradostians used the Upper Paleolithic technique of flint-knapping, striking off blades which were used as blanks for tools. They had more stone tool types, a variety of bone tools and they also possessed a woodworking technology such as the Neanderthals never had. Probably they used elaborate wood-carving stone tools to fashion traps and more advanced kinds of hunting apparatus and with this equipment they pursued much the same kind of game animals (mainly goats) as their extinct Neanderthal predecessors had.

By 35,000 B.C., the Neanderthals seem to have disappeared from the world altogether and we may well ask, what did Upper Paleolithic *Homo sapiens* have that the Neanderthals did not have? To my way of thinking, there were probably two things that weighed heavily in the balance. One was language. Jacquetta Hawkes, the English student of language and prehistory, feels that although the Neanderthal was a skilled toolmaker, his tool kit shows a conspicuous lack of invention and adaptability. He was probably handicapped because he did not develop a fully articulate and precise language. This was the new weapon which we think his Upper Paleolithic replacement possessed and used to make a tool kit so diversified that in the graver category he had more working edges than master cabinetmakers are accustomed to working with today. With his greater articulateness, he was able to describe and demonstrate the details of the manufacture of these stone tools to his people, including the children who were to carry on the group's activities.

The second critical cultural achievement of Upper Paleolithic man, in my opinion, is his ability to keep track of events for the future. Alexander Marshack, a research fellow at Harvard, has provided us with this recent and powerful insight into prehistoric man. Thousands of notational sequences have been found on engraved bones and stones dating as far back as at least 30 millennia. These markings have been puzzled over or guessed about by archaeologists since the time they were first discovered more than 100 years ago. Marshack has determined that they served Upper Paleolithic man as a kind of farmer's almanac tied in with a lunar notational count. Some are illustrated with the natural history of the events, giving the possessor of the object a mnemonic device reminding him when to expect the change of seasons and the movements and dispersal of game.

An ancestor of sympathetic character

In short, this was of tremendous economic advantage to Upper Paleolithic man, and it gave him a control over his environment and destiny such as was evidently denied to his predecessor, the Neanderthal.

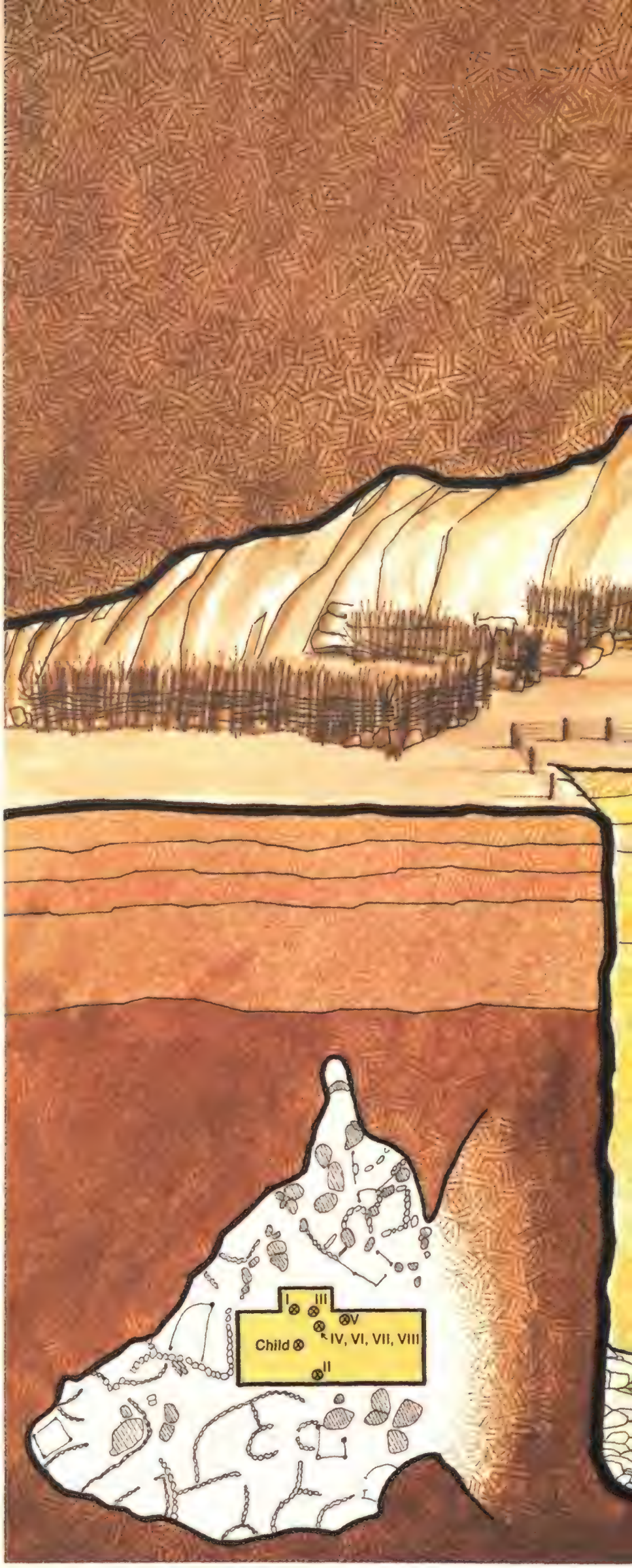
So, men with these remarkable abilities and all that flowed from them overtook and presumably eliminated the Neanderthals. We have long thought of the Neanderthals as ultimate examples of the Hobbesian dictum that the life of a primitive man is "nasty, brutish and short." They have been characterized as having a near-bestial appearance with an ape-like face in profile, a thick neck, stooped shoulders and a shuffling gait. But now it appears that they were actually very similar to *Homo sapiens* in skeletal structure. Stewart's study of the Shanidar Neanderthals led him to the conclusion that below the head there was not too

much difference between these early men and modern man. Of course, one cannot deny the bulging prominent eyebrows and the heavy coarse-featured face of the Neanderthal in general, though Anthropologist Earnest Hooton once said: "You can, with equal facility, model on a Neanderthaloid skull the features of a chimpanzee or the lineaments of philosopher."

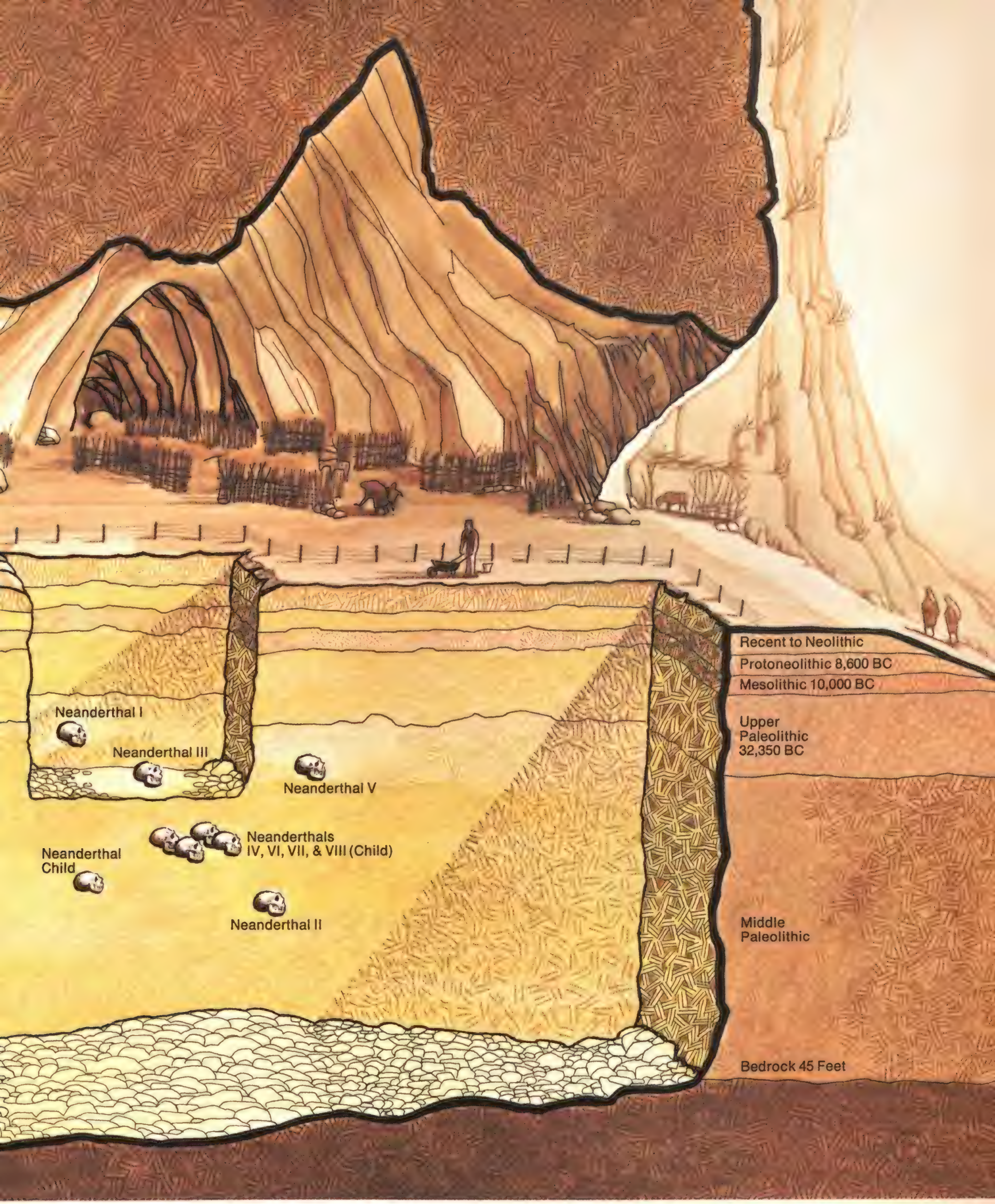
His own biological evolution is something man really does not have conscious control over. But his culture, his social and religious life, is something else. In the millions of years of evolution that began with the ape-like hominids of Africa it is among the Neanderthals that we have the first stirrings of social and religious sense and feelings: the obvious care with which the lame and crippled were treated, the burials —and the flowers. Flowers have never been found in prehistoric burials before, though this may simply be because no one has ever looked for them. And to be sure, only one of the burials in Shanidar Cave yielded such evidence. But the others buried there could have died during the wrong season for flowers, since death knows no season.

The Neanderthal has been ridiculed and rejected for a century but despite this he is still our ancestor. Of course we may still have the privilege of ridiculing him, but in the face of the growing evidence, especially in the light of the recent findings at Shanidar, we can not actually reject him. And what person will mind having as an ancestor one of such sympathetic character, one who laid his dead to rest with flowers?

For some 60,000 years, Neanderthals used this cave in the mountains of Iraq as a seasonal home, as do the Kurds of today.



Ground plan of Shanidar Cave (inset) and skulls in excavation indicate approximate position of the nine Neanderthal finds and their time scale.


Recent to Neolithic
Protoneolithic 8,600 BC
Mesolithic 10,000 BC
Upper
Paleolithic
32,350 BC
Middle
Paleolithic
Bedrock 45 Feet
Neanderthal I
Neanderthal III
Neanderthal V
Neanderthals
IV, VI, VII, & VIII (Child)
Neanderthal
Child
Neanderthal II

A smiling Chanel, after 15 years of retirement,
reconquered the fashion world in 1954
with the simple elegance of her new collection.

By Joseph Barry

'I am on the side of women,' said my friend Chanel

Coco, the late grande dame of fashion, led women out of whalebones and feathers and put them into suits, slacks and tans

It is four months since Chanel died and 124 pages of my notes are falling into place. She and I had been working desultorily since 1964 on her memoirs (which she would never write) and a monthly column of maxims (which she would). Actually the key to her enigmatic character, the clue to history's most famous fashion designer, was always at hand.

We were considering one of her maxims for the monthly magazine column. "For me," it read, "money has never had anything but the sound of freedom" (*liberté* in French).

It is a well-known Chanel quote. Alan Jay Lerner used it in the musical, *Coco,* apparently with some success. "Freedom" rings in Broadway ears with a nice star-spangled sound.

"Change *liberté,*" said Chanel in her low, husky monotone, "to *indépendance.*" I asked why.

"Freedom and independence," she said, "are not the same. Pity the woman *en liberté.* She has no one and is dependent on everyone. Independence is something else." Then Chanel added reflectively: "Of course, if she achieves it, it means unhappiness."

Solitude and independence, said Lerner, were the two themes of his musical on Coco Chanel. Not bad. They catch the price she consciously paid for the preoccupation of a lifetime. I have met no one so suc-

Joseph Barry, author of the Paris Commune article in SMITHSONIAN *in March, is writing a book on Versailles which Doubleday will publish next fall.*

A smiling Katharine Hepburn recaptures Chanel upon the famed stairway in the musical, *Coco.*

As a young girl, Chanel wore her hair
long enough to sit on—and piled it high.

cessful who was so sad. Perhaps it was because I have never met so successful a woman. Perhaps it was because I met Chanel when she was turning 81 (she died at 87), but I don't believe so. The aged Frank Lloyd Wright remained full of projects and a sense of personal triumph. Picasso has, in Gertrude Stein's categorical phrase, a Spanish pessimism, but not a draining sadness. Alice Toklas, finally, just waited to die, not sad, *resigned* to her lack of money.

Money was a recurring theme for Chanel. "You should have nothing in your pockets but money," she would say, addressing women. But persisting in my memory is the sadness of one of the first of the modern women and the last of the empresses. At its height in the 20s and 30s, Chanel's empire consisted of a fashion house, a wool mill, a workshop for costume jewelry, several perfume laboratories and over 3,000 employees. Lately there were 300 in the Paris couture house, but the perfumes alone, especially Chanel No. 5, brought in millions of dollars every year, outselling all others in 140 countries—and Chanel had a royalty of two percent, as well as an imperial salary. Her choice.

Most of Chanel's life was her choice, from the time she left her aunts as a teen-ager on the arm of a cavalier until, but not including, her death. As soon as she could manage, she set up shop for herself in the early 1910s. She had a rendezvous with the emancipated woman of the 20s—and she kept it. Rich women wore her clothes, but thousands more wore copies—and Chanel was all for it. "Let them copy," she said of seamstresses. "I am on the side of women, not the fashion houses."

First she took the birds women were wearing for hats out of their hair and the women themselves out of their bone corsets. She bobbed her hair, and women followed suit. She wore sailor pants in Venice, so she might step gracefully in and out of gondolas, and so she put women into pants. When she came up from Cannes one winter with a tan, women in Paris paled and the suntan look was launched. Under that look was something significant: women's assertion of their place in the sun. Chanel designed for women in action, not women as porcelain objects or hobbled clotheshorses. "There," she said one day of a suit she was designing, "is a dress you can invite to lunch that can stay for dinner." And breakfast.

So successful was Chanel's revolution that we forget what brought it about. But at the time, it provoked a sharp rebuke from Paul Poiret, the most fashionable dressmaker of pre-World War I. Typically—and all too familiarly—he complained of Chanel's defeminized women—as *he* saw them. "Women," he said, "were beautiful and architectural, like the figureheads of ships. Now they look like undernourished messenger boys." Figureheads indeed! It makes Chanel sound like a very early leader of Women's Lib.

She was, but in her fashion. Not by leading parades or demonstrations, which is not yet the Frenchwomen's pattern, but by design and example. She was a leader of the unorganized women's revolt of post-World War I which struck at the tyranny of bustles and frivolous styles. Women struck again—in a more organized way—just last season at the attempt to impose maxi-skirts and mid-calf longuettes after a spell of minis and other exposures. And again Chanel was in the vanguard. By being on her own.

When women were once more unhobbled this win-

ter, the London *Sunday Times* fashion reporter sighed with some relief and wrote, "Chanel, after all, was right." Chanel had objected to the maxi as reactionary folklore. Her previous tart criticism of the mini-skirt, "One is not 16 very long," seemed proof that, at long last, she had lost touch with youth—not surprising for a woman in her ninth decade, who, as she watched Neil Armstrong walk on the moon, could recall having to read by candlelight. There were 60 years of womanhood in her comment—lost years, if she submitted to a new tyranny of teen-age values.

"We are the sacrificed generation," she had heard a Frenchwoman say at the dinner table. "At 16, we longed to be 30—mature, married, free at last to wear jewels, décolleté and grown-up dresses. Now, at 30, we are told we must dress like 16-year-olds or consider ourselves finished."

"Finished at 30!" said Chanel. "If so, it is women's own fault if they accept the new dictates of *yé-yé* fashions." Chanel was virtually alone in this attitude. But she was a loner all her life.

There were several men in that life—never a series. Most notable was the affair, if a relationship spanning two decades can be reduced to an affair, with the Duke of Westminster, one of Britain's richest men (his family owned the best acres of London). Two yachts were at his disposal, couriers carried his letters to Chanel when they were separated. But a story, so apt it had to be invented, has Chanel remarking to the Duke, when she refused to marry him: "There have been many Duchesses of Westminster, but there is only one Chanel."

House of Chanel was her child

"If I had said that," she told me, "he would simply have laughed at me." But she continued: "I had my work. The two men I have loved never understood it. They were rich men and could not understand why a woman who would have money would want to continue working. But I could never give up the House of Chanel. It was my child. I created it. From rags."

There was also the discouraging spectacle of contemporary marriages. " 'Why should we get married?' " Chanel repeated what she once said to the Duke of Westminster. " 'We are together. People accept it.' And I pointed," she went on, "to a couple across the room. They were talking to each other in the bored way of man and wife. 'If that ever happened to us,' I said, 'I would fly away.' I never wanted to weigh more heavily on any man than a bird."

Nor did Chanel ever want any man to weigh more heavily on her: "One day in Scotland I told the Duke I was returning to my house in Paris. The next morning I came down to breakfast. At my place was a little

Short-haired and chic, Coco visited London in 1931. Six years later, aged 54, she adorned a Paris costume ball (below) as Watteau's *Indifférent*.

In her luxurious, book-lined apartment, Coco escaped the downstairs turmoil of *haute couture.*

bouquet, but no Duke." With the male, Hemingway gesture, he had gone off to shoot birds, "because he was displeased with me."

There was also the case of Picasso. "You should be grateful I saved you from him," a friend told her.

Chanel: "She was always saving me from someone. 'Do you think I am the kind of woman Picasso wants?' I asked her. 'He wants a maid, like all artists. Someone to sleep with, someone to wash his clothes and make his meals. Someone who would not be a strain.' "

So Chanel had no husband or even, in the profoundest sense, companion for herself. *There* was the void and the wound. She was a woman who had her work and she was, therefore, alone—*la Grande Mademoiselle*. "In France," she once brooded, "men don't like women who succeed. Do they in America?"

Do they? If Chanel was born too soon and in the wrong place, where then should she have been born, and when—in 1971? In the year 2000? She lied about her own date of birth (August 19, 1883). She lied about her place of birth (Saumur), throwing off biographical trackers. And she changed her name. It was a slight change—Chasnel to Chanel—but she laughed privately at the Chanels who claimed kinship. She hated her youth and, whatever the truth about it, that is the way she recalled it, smothering it with lies.

But in a low moment she reminisced that even as a child she felt there was "something going on" between her father and the maid, and she remembered her mother as an invalid lying in bed being lifted from time to time to kiss her. Both parents disappeared by the time Chanel was six, her mother by dying and her father, a traveling wine merchant, simply by taking off, apparently for America. Once Chanel hinted at his killing himself, as if that were a nobler departure. Her aunts, with whom she was left, had her spend her afternoons, after five, preparing her trousseau—marriage was her only conceivable future. It was most likely why Chanel later in life never touched a needle and even denied she could sew.

Here in France in our own time, Evelyne Sullerot, French sociologist, has a favorite demonstration test for young students—each is asked to describe a day in his or her life at the age of 50. "Immediately," she says, "the boys start writing, seeing themselves as the P.D.G. [*Président-Directeur-Général*] of their firms. The girls hesitate, are visibly agitated, then furious. They cannot imagine themselves past the age of 'pleasing men' or raising children, though on an average they will have had their last child at 30."

A revealing test, perhaps not only for France. But even as the century turned, a youthful Coco Chanel, born Gabrielle Bonheur Chasnel, revolted. She fled the provinces and her aunts with a young French officer, scion of a wealthy family of industrialists (whose brother would marry Consuelo Vanderbilt). She lived and learned in his château near Paris.

And then there was Arthur Capel, nicknamed Boy, an enormously rich, polo-playing Englishman. He and the Duke were the two men Chanel said she had loved.

Snipping, ripping, pinning, pleating—fingers flying, Chanel puts the final touches on a 1959 creation.

But there was the humiliation of Boy's lessons, of her being kept, and finally, when she matured, his failure to understand her ambitions.

Early in their liaison Chanel reproached Boy Capel for not bringing her flowers or jewels, as men in love were supposed to do. The next day, after he left, so many flowers arrived there was no room for them. "When he returned," Chanel told a *Vogue* reporter, "his eyes wicked with glee, having made such a delicious joke of my sticky sentimental French-novel yearning, he found me in tears."

And Boy sent her a jewel from Cartier. But young Coco did not know how to wear it. "It doesn't fit," she told him sulkily.

"Try it on," said Boy.

"It's too big for my wrist."

"It's not a bracelet, my silly."

"It doesn't close around my neck."

"But it's not a necklace."

Chanel to Bettina Ballard (in the latter's book, *In My Fashion*): "He was making fun of me again, and I was helpless in his hands. He knew so much more than I did. I jumped at him furiously, pounding my fists on his chest and crying, 'What is it, why do you tease me, why do you make me feel ridiculous?' "

The jewel was a tiara, as for a queen. And for one who only knew Chanel as the empress who had taught women how freely to wear cascades of false jewelry, the story is priceless irony.

Shortly before World War I, Chanel rented a boutique in the Hotel Normandie at Deauville, backed by Boy. He told her she was silly to work, and gave her a book of signed blank checks. But the young modiste's simple, uncluttered hats, the dresses and sweaters that went with them, were a huge success. "I earned 200,000 gold francs," Chanel said, "and gave the checkbook back to Boy." She would never again depend on a man. Her fashion house on the rue Cambon in Paris spread to five buildings, and the rest is fashion history.

The girl from the provinces became the Maecenas, the "patron," of the arts when Paris was their capital between wars. When Diaghilev's Ballets Russes failed in England, Chanel financed them in France. When Stravinsky had difficulties about a concert, she quietly guaranteed a hall for him. The two were very close, but in one of their last walks along the Seine, as they talked of what life might be like together, she said to

Coco invaded Moscow in 1967 with her mannequins (above) to show off the classic Chanel look.

him, "You would only crush me under your music."

For 50 years Chanel reigned over fashion with style, "because," her friend Cocteau explained, "there was nothing in her era that she missed." Above all, unlike other dress designers, she didn't miss the principal direction of her era: the emancipation of women. When women finally, in the 20s, entered the 20th century, they found Chanel waiting for them. In the 1910s she had already designed tailored sport suits. In the 1920s she introduced cardigan sweaters and jackets, comfortable sling shoes and jersey dresses that moved with the body. "I have always tried to give women a feeling of being at ease with their time."

"She has," said Picasso, "more sense than any woman in Europe." And she made sense for all women.

But as World War II approached and Schiaparelli's square, military shoulder had its moment in fashion, Chanel closed her House and retired to her rooms under the roof at the Hotel Ritz, just up the street. The 40s passed, then boredom: falling sales in Chanel perfumes. Christian Dior brought Chanel out of retirement in 1954 for an astonishing comeback.

Chanel was challenged, she said, by Dior's New Look, "with its built-in corsets and stays." And she told of a friend who had sat squirming on her sofa. "What's the matter?" Chanel had asked. "Oh," said the friend, "I have something sticking in me here, and something there"—and pulled out a stay. Chanel reopened her House and reconquered her public, with the classic suit of the 30s and the common sense that had raised her to the level of a genius in an area known largely for its nonsense.

Watching Chanel at work was instant understanding. She stood under the bright lights, scissors suspended from her neck by a ribbon lost among the pearls. A mannequin would pose briefly on a small platform, then approach. Chanel would feel for the body inside the fabric. With displeasure she would scissor open a seam or rip at it impatiently if it resisted, stripping panel after panel of material from the mannequin. Then she pinned back the material, lining it against the model's body, making it a second skin. "Swing your arm," she would command hoarsely, then heighten the armhole so the sleeve moved with the arm, but not the jacket. She would examine the skirt. "Make a pleat here," she would tell her workroom head, "an *intelligent* pleat."

Chanel's hands were no longer so strong or so straight as in legend; arthritis had swollen the joints. But they probed vigorously for the exact point of the shoulder, the hip, the slight curve of the small breasts and behind. And when my eyes shifted from Chanel to the distant reflection of her in a mirror, the years seemed to fall away, as if in a flashback. She was no longer in her 80s. She was the young, dynamic woman who rode, loved and worked, her body striking the unconscious—beautiful and timeless—pose of Chanel in full creative power. I never tired of watching her, nor am I likely to forget her famous anatomy lesson, delivered for my benefit the first time I watched her,

The late Duke of Westminster, reputedly England's richest landowner, was one of Chanel's two great loves.

though addressed to her white-smocked *premiers, premières* and models, sitting like starlings on a row of gilded chairs.

Hands on hips, one leg thrust forward, Chanel lectured them. "A woman's shoulder is here," she said, pointing at her own. "See how it comes forward slightly. That's why it is feminine and pretty. It is not like this"—she squared her shoulders—"that's for men. Look at the sleeve"—she dangled her own—"if it hangs well and the hands show well, all is well.

"Look for the woman in the dress. If there is no woman, there is no dress."

She dismissed them and we went up to her apartment on the third floor. It was reached by a spiraling staircase walled entirely with mirrors. Ceiling high, the narrow, vertical strips of glass fractured and froze each fragment of motion so that even a man felt like Marcel Duchamp's nude on another famous staircase. From the top of those stairs outside her apartment, Chanel would sit and watch the parade of her models in summer and winter collections, studying the mirrored reactions of her audience.

Inside was a world apart, sheltered by walls of books and great Coromandel screens. And here on a long, beige, suede-covered sofa, facing a pair of bronze fawns looking at each other before the fireplace, in a sanctuary of Louis XV furniture and museum pieces, Chanel plotted her revolution.

There is still no better description of it than Balzac's. "Dress is the expression of society, for fashion has never been just a question of costume. Dress being the most energetic of all symbols, the Revolution was also a question of style, a debate between silk and woolen cloth."

Seasonal style change seemed folly

Chanel subliminally echoes Balzac: "Style must become popular, it must descend into the streets, into people's lives, like a revolution." A change in women's life style, for Chanel, alone justified a significant change in fashion—which in turn spurred the changing life style. For one with this sweeping view, for one who had seen three generations of women through a major change, the twice-yearly fashion "changes" were follies for all but the rich few who had nothing else to do but follow them.

Chanel equated independence with unhappiness, because such had been her experience. "Solitude," she said many times, "may help a man towards achievement, but it destroys a woman." She never sought solitude, but accepted it as the "inevitable" consequence of independence. It had not destroyed her, certainly. But it had marked her. She saw a woman's love as invariably a one-way street that led those who would be independent to despairing loneliness. The maxims she scribbled on scraps of hotel stationery, when she could not sleep—"which was too often"—reveal it:

"Love is a form of sadness." "To love is to cry, to be loved is to be happy—and how rare that is!"

"I would tell women," Chanel said with firmness, when we discussed her first monthly column together, "to jump out of the window if they were the object of passion, to flee it if they felt it. Never to dream of great passions, because they are not love, which is warmth, tenderness, affection, understanding."

One of the notes Chanel gave me throws a sharp, early light upon herself. "I certainly have my faults," she said frequently enough. But the note reads: "It is what is best in me that irritates others, and often friends—a taste for justice and truth and freedom." She had struck through the word "freedom," as perhaps too vague or inaccurate an expression for what she later decided was "independence."

Coco, at 84, still ruled her world from her stairway.

By Peggy Thomson

A taxidermist's frozen menagerie

Anything from alligators to insects can be preserved in Rolland Hower's vacuum tank in the museum's freeze-dry laboratory

Opening day in Rolland O. Hower's freeze-dry lab in the Smithsonian's Natural History Museum is a routine monthly chore. It is also a happening. When the great round door of the nine-by-five-foot vacuum tank swings open, Hower looks into a jumbled but peaceable kingdom—a jungle of animals posed motionless, in flight, feeding, stalking, poised to strike. Coot and coyote with glassy eyes look back out at him—and a hawk, mole, budgerigar, rats, warblers, diamondbacks, mud turtles, alligators and bats.

Every month all the animals are taken out and weighed, their conditions noted and a decision made. The animals with more water yet to lose are put back in. The ones which are thoroughly dehydrated are kept out, ready for display.

By the time the tank is bare, every surface of the lab, already overcrowded with freezers, vacuum tanks and condensers, is covered with animal specimens, the new muscling out the old, some of which already swing from lighting fixtures or pace along the uppermost ducts. A three-foot Australian monitor lizard hanging ignominiously, hooked over a nail, keeps his jaws clenched on a rat (local product from a Smithsonian trap). Shearwaters nest on the bookcase alongside starlings. A praying mantis shares the Out Box with a trio of cowbirds, a gecko and a black widow spider.

The freeze-drying of animals such as these for museum display is a process pioneered by engineer and designer Hower and is used extensively nowhere else in the world except England. Hower came to the Natural History Museum in the early 1950s just when a large supply of animals was needed—50 species for the marine hall alone. The three available taxidermists were swamped with work. Drawing on what was learned of dehydrating foods in World War II and on Naval medical research, Hower set up a vacuum apparatus which, at sub-zero temperatures, withdraws from the animal specimens the water frequently making up 70 percent of their weight, thereby preserving the animals intact.

Animals dried at room temperatures tend to shrink. As the water is removed from them, their cell walls collapse. In frozen animals, though, where ice crystals in the tissue are transformed at reduced pressure directly from their solid state to a vapor—thus bypassing the liquid state—the cell walls remain rigid. The animals look essentially as they do in life and, with the application of a little flea and tick powder, they can be displayed indefinitely in ordinary atmosphere without sign of spoiling.

Since 1957, Hower has turned out hundreds of animals for the museum's halls—filling in the gaps, replacing turn-of-the-century specimens that were beginning to look tattered or lackluster and exhibiting for the first time such animals as snakes, octopuses and spiders that formerly were seen only as plaster casts or floating in jars of alcohol. In the process he eliminates the need to eviscerate, skin and stuff—all the messier aspects of taxidermy—and saves time.

The jellyfish flopped

"Preparing a turtle may take a taxidermist three days to three weeks," Hower points out. "It's a long, slow human process. Freeze-dry is a long, slow process, too. Depending on size, the turtle may be in the chamber from one month to four, but preparing it takes one man-hour, for wiring it into position and inserting the eyes, and the poor, idiotic freeze-dry machine doesn't know it's working 24 hours a day."

Hower also claims better results. "The anatomy's done for us and we can concentrate on realistic positioning." He rates his small mammals and birds as highly successful. They are glossy of fur and feather, faithful in form, size and color, requiring only a touching up of faded membranes around eyes and mouth. Also successful are his amphibians and reptiles, which retain their textures, properly mucoid or scaly, though there's sometimes a slight color loss. Larvae, arachnids and furred insects come out fine; crustaceans and smooth insects somewhat less so. And freshwater fish are a difficult problem because their natural oils resist

The author, a Washington free-lancer, spends a lot of time behind the scenes at the Smithsonian.

the drying process. His jellyfish, predictably, was a flop. (It came out a little pile of ashes.) So was Luci Johnson Nugent's wedding bouquet which went pretty much to pieces.

The basis of the freeze-dry method lies in understanding the relationship of pressure and temperature to molecular dynamics. Hower's apparatus consists of a vacuum chamber insulated on the outside and lined with refrigerator tubing, a condenser and a gas-ballasted vacuum pump. The animals are frozen slowly, then thawed and positioned in the desired attitudes with care reminiscent of *The Loved One*. They are then refrozen rapidly and moved into the vacuum chamber where they remain until virtually all of their moisture is withdrawn.

"With the vacuum at low temperature," says Hower, "we are creating a theoretical boiling point below the freezing point at which the movement of molecules within the ice crystals is greatly accelerated. As a result of the high velocity and constant collision, water molecules break away from the ice crystals within the animal tissue and escape into the atmosphere outside. These water-vapor molecules are continuously removed by being drawn to the lower vapor pressure in the condenser. Essentially we're collecting the ice crystals and pouring them down the sink."

On the occasion of the main chamber opening this past February, Hower unloaded for the last time a crocodile head, which is the largest mass he has ever accommodated in his tank. It had gone in 13 months before at 65 pounds and having lost only 30 grams in the final two months, was deemed finished, weighing 30 pounds. Hower ran an appreciative hand over the knobby exterior, prescribed transparent oil paint for a pinkening of the mouth and a bit of wax to be inserted around the eyeballs which, he feels, look reasonably authentic even though they are glass deer eyes turned sideways. From the same load the gray fox was found to have one sagging ear which needed reconstituting with a syringe of water before the fox was returned to the tank.

Adorned with a chimp's arm (above), the vacuum tank door is opened (below) to let Dr. Hower check up on his peaceable—and frozen—kingdom.

An odoriferous sideline

Hower has turned over most of the day-to-day work with the animals to his assistant, Robert Winkelman, a freeze-dry taxidermist. Winkelman has become expert at positioning animals and at custom-making plastic glass eyes. He is also learning to perform transplants where necessary from a spare-parts drawer containing such items as a fox leg, Chinese pheasant wings, one elk ear and assorted paws and claws.

Hower has begun experimenting with the freeze-drying of blood. He hopes to come up with standardized procedures and a readily transfusable product.

He has already done a great deal with freeze-dry in the field of mounting specimens for medical research and teaching purposes and has moved into the whole field of scanning electron micrography with the freeze-drying of single animal cells and of nematodes which are coated with a film of gold and photographed, enlarged 20,000 times.

As exhibits chief of research, Hower is also in charge of the museum smells that are wafted out from a dozen or so exhibits to add an extra dimension of sensory experience for the visitor. It is a job to which he can devote at most an hour a day before he loses his discriminating nose.

Some of the smells are very successful. The chocolatey aura around the confectioner's shop is so convincing that guards have been known to bite into plaster candies on a slow day. That smell is available commercially. His stable smell is quite satisfactory, he says, spraying it out from a beaker of golden liquid and then leaning into the mist. It's compounded of nine substances—cod oil, skatole, civet, amyris, dill, musk, parsley, garlic and stearic acid. He is also satisfied with his leather and oil smell for the machine shop, his new-mowed hay smell for the agriculture hall, his frankincense smell for the apothecary.

Some of his current assignments are troublesome. Seashore smells are unstable; he can't help thinking the dead-fish smell requested by a curator might be most practically handled in a direct way, "though a dead fish hanging about could presumably be a disease carrier." And he's sure if he's accurate with the "18th-century cesspool smell" he'll incur the wrath of neighboring offices.

"My apple-pie smell, though, for the miller's cottage," he boasts, "is just about perfect." It's mostly oil of rue, which smells of stale apple, and seven other things including cinnamon and a touch of oil of tangerine to sweeten the rue. Hower—eyes closed in appreciation—is interrupted by the arrival of a messenger with six white pigeons packed in dry ice (inexpertly, he notes, with "feathers catawampus like hair set backwards"). The pigeons were sent to him by New York University research psychologists who want them freeze-dried "in positions indicating aggression."

As taxidermist Robert Winkleman spruces up the eye of a freeze-dried crocodile head, the Smithsonian's Rolland Hower (right) pauses for a moment in his current menagerie.

ROBERTS BIRDS

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H-5

Nude Woman with Herald's Wand (1498).
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The Robert Lehman Foundation

Thirty-six of Albrecht Dürer's seldom-seen drawings highlight a 500th anniversary exhibition at the National Gallery of Art

"At Zierikzee in Zeeland a whale has been washed ashore by a great tide and storm; it is much more than one-hundred fathoms long; no one in Zeeland has ever seen one even one-third as long . . . ."

So wrote Albrecht Dürer, Germany's greatest artist, as he braved the Netherlands' bitter cold in the winter of 1520 to view what was then a great natural phenomenon (at the same time aggravating the mysterious disease that finally killed him eight years later). Much has been written about Dürer's insatiable interest in everything that could possibly be seen and explored, and the current exhibition of his drawings, prints and woodcuts at the National Gallery of Art in Washington—the largest ever held in the United States—demonstrates once again the extraordinary range of Dürer's interests and his art.

In his eager curiosity (his various trips took him through Germany, Italy, Switzerland and the Netherlands), he was equally fascinated by Leonardo's scientific theories, the gold brought back from Cortés' expedition to Mexico, exotic foods and wines—even dancing lessons. His life spans five decades of late medieval, Renaissance and Reformation history, and his art reflects the great economic, political and, above all, religious upheavals of his day.

The usual judgment of Dürer is that he united the late Gothic age with the Renaissance. Yet this exhibition illustrates once again how he defies neat theories.

He was first of all a German. His father, a master goldsmith, had emigrated from his native Hungary and settled in Nuremberg. Albrecht was the third of 18 children, only three of whom lived to adulthood. The family was hard-working, pious, and suffered from the plagues, epidemics, periodic famines and economic crises that were the lot of most in medieval Germany. Seen against his poor artisan background, Dürer's lifelong preoccupation with money and social status is easy enough to understand.

No other European language has an equivalent for the German word *Handzeichnung* ("hand-drawing"), which stresses that the hand of an individual has rested on a piece of paper, imparting to it a sentimental value much like that of a souvenir. This almost religious idea of the hand—"the hand of an individual chosen by God"—is clearly expressed in this exhibition, which commemorates the 500th anniversary of Dürer's birth (some 35 other American museums are also planning exhibitions, although nothing like the year-long festivities in the artist's native Nuremberg). The National Gallery show, which closes June 6, includes all but two of the 38 Dürer drawings known to exist in North

Self-Portrait, Hand, and Pillow (1493). The young artist made face, hand and pillow equally important.

Joanna Eagle is the Washington correspondent of Art Gallery *magazine. She was formerly with* Art News *and is the author of* Buying Art on a Budget.

America, along with 207 prints, ten books illustrated with his woodcuts, six bound volumes, and two supplementary sections (all of it backed up by a splendidly authoritative catalog obtainable from the Gallery). What makes it the most important of the American exhibitions is the opportunity it provides to view so many of the rarely seen drawings, along with the much more familiar engravings and woodcuts.

Of the many ways of making a picture that are open to an artist, drawings are the most personal and versatile. They are often the first thoughts of their creators, revealing their most spontaneous, intimate moods. What makes the difference, of course, between drawings and other kinds of art is the lightness of the materials employed. That Dürer enjoyed drawing *as* drawing, and that he employed all the techniques available to him—metalpoint, pen and ink, chalk and charcoal—is well illustrated in this exhibition.

He saved most of his drawings for his own use. Of the thousands he must have executed, only about 1,000 are still extant, most of them in European collections. But if one had to pick any 36 drawings out of his total, those on view in Washington come as close as one could to showing the whole range of Dürer's development and interests.

The earliest and latest drawings in the exhibition are both self-portraits. Throughout his life he portrayed himself often, in paintings and individual studies, such as the *Self-Portrait, Hand, and Pillow* (page 43), and as a bystander in religious compositions. The self-portrait mentioned above was executed in 1493 during Dürer's *Wanderjahr,* a four-year "bachelor journey" during which he visited and worked in Colmar, Basel and Strasbourg.

Dürer looks out at us with a slightly oblique, troubled glance. The attempt to portray a specific human being in all his individuality is a Renaissance idea; Dürer accepts it, but his means are still Gothic—in the little hooks and crosshatching of the shading, and in the play and pattern of the line.

Dürer was by no means the first artist to make likenesses of himself, his family and his friends, but we know of no other artist before Rembrandt who so frequently turned his eye upon himself; it is a tendency toward self-absorption that is typically German. Because of certain distortions in the features (the looming nose, the mouth suddenly diminishing to the right, eyes which appear to rest on quite different planes), experts believe that this self-portrait was done from a mirror.

On returning from his first trip to Venice in the spring of 1495, Dürer established himself as an independent master with his own workshop and began to reap the harvest of his varied experiences. It was a period of intense productivity in which he turned out 12 paintings, more than 25 engravings, seven large woodcuts (he had brought back from the south the idea of making single-sheet prints independent of a text) and executed the greater part of his *Large Passion* and the whole of his *Apocalypse* series.

Two drawings of nude female figures from this period show Dürer's attempts to synthesize Flemish-German traditions with those of the contemporary Italians. *Nude Woman with Herald's Wand* (1498; page 42) was one of the first Dürer drawings to enter an American collection when E. B. Crocker, founder of the Crocker Art Gallery in Sacramento, California,

Nelson Gallery—Atkins Museum (Nelson Fund)

Four Heads in Profile (c. 1513), pen and ink. Part of Dürer's research in human proportions.

purchased it in Europe in the 1870s. At the National Gallery it is being seen outside Sacramento for the first time since its purchase. This nude contrasts with the *Fortuna in a Niche* of the same year (page 45) in conception of figure, drawing technique and purpose; her slightly twisting pose is complex, showing the more sophisticated approach to the subject that Dürer had acquired in Venice. She has classical proportions, while the Fortuna is more Gothically conceived with protruding stomach, high waist, narrow chest and elongated proportions.

The year 1500 marked a dramatic change in the artist's style and preoccupations. It was about this time that he became engrossed in the study of human proportions, largely as the result of a visit to Nuremberg by the Venetian artist Jacopo de' Barbari. The Venetian showed Dürer drawings of "constructed" male and female figures, but foxily refused to reveal his system. Dürer then began his own searching studies of human and animal proportions, as well as perspective, going back initially to the writings of Vitruvius.

A preoccupation with Adam and Eve

The exhibition at the National Gallery is fortunate in having several of the "constructed" figures which led to Dürer's initial summary of these studies: his engraved *Adam and Eve* of 1504. The show also includes the most important of the engraving's known preparatory studies—the *Adam and Eve* drawing from the Morgan Library (page 48), repository of the largest number of Dürer drawings in this country.

The *Adam and Eve* was originally two separate drawings which Dürer trimmed and pasted together with backing strips to create one composition. It is still very much a working drawing. Eve's left arm was at first somewhat lower, and the original outline can still be seen beneath the wash.

As the relationship of the figures in this drawing is different from that in the familiar engraving, there were probably subsequent studies between this and the final one. The engraving depicts an earlier moment in the story of Man's fall. Adam's hand is still empty, as Eve takes the apple from the serpent's mouth (in the drawing Adam already has the apple in his hand). The background wash of the drawing was replaced in the engraving with a delightful primeval forest full of trees, bushes, plants and animals. In both the drawing and the engraving, Eve represents human beauty rendered in terms of static form, while Adam is conceived in terms of dynamic movement.

Dürer went back to Venice in the summer or fall of 1505, revisiting it as an established master, now better prepared to absorb the Italian point of view and the qualities of Venetian painting. His preoccupation at

The Robert Lehman Foundation

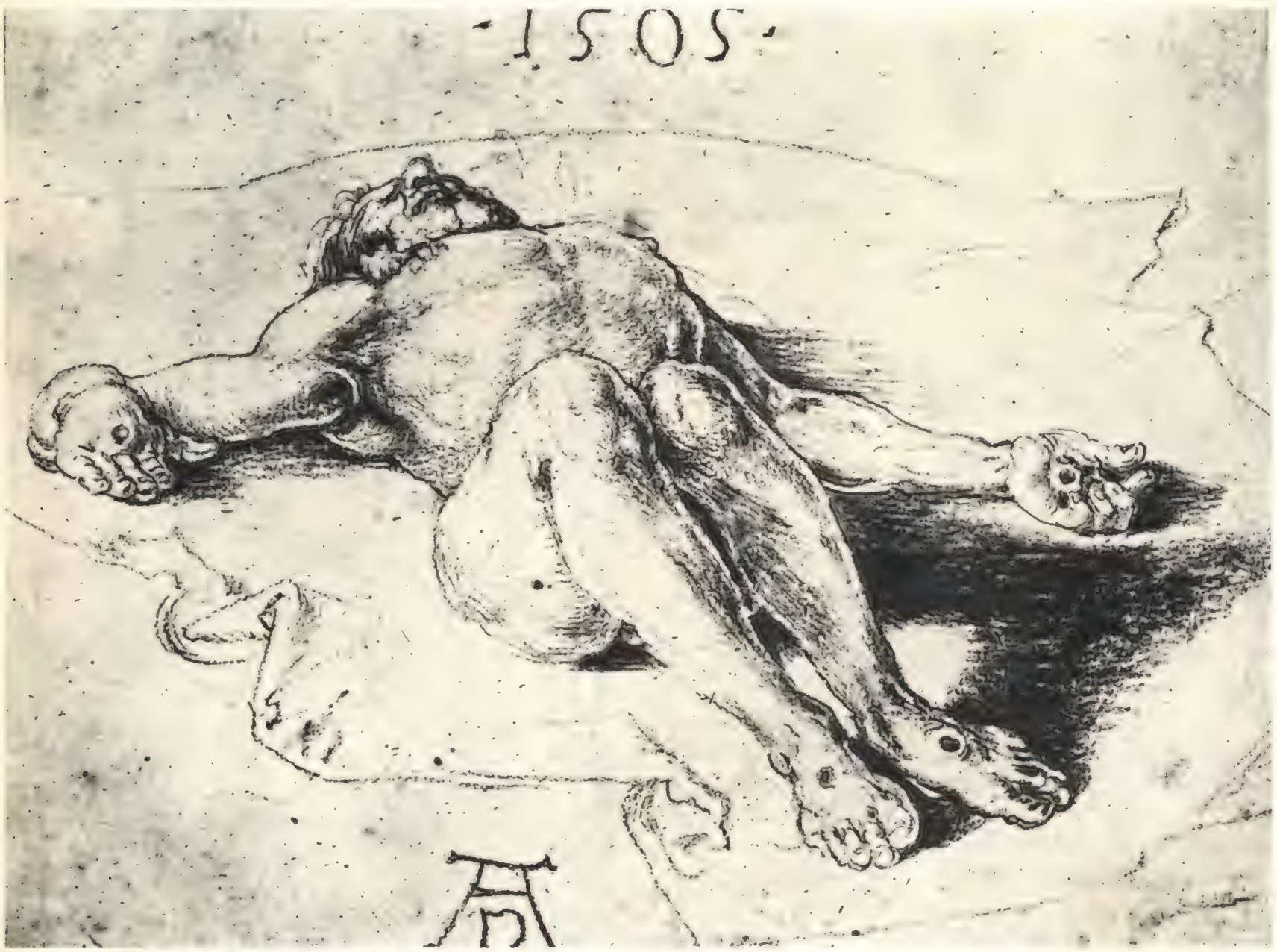
Fortuna in a Niche (1498), pen and ink.
A Gothic nude, influenced by Italian classicism.

the time with effects of light and color (though he was denounced as having no "color sense" by some of the jealous Venetian painters, about whom he wrote home: "I have been warned not to eat or drink with them") is seen in his impressive chiaroscuro full-length study for a kneeling figure (page 47). This *Kneeling Donor* of 1506 occupies a prominent place in the altarpiece commissioned from Dürer by the German merchants of Venice for their national church there, San Bartolommeo (the painting is now in Prague).

Like many of Dürer's more finished drawings, this is most probably not a drawing from life but a summary of many previous studies. Now, also, Dürer had access to a spatially evocative blue paper that was dyed in the manufacture rather than being colored with an applied opaque ground. Using the tone of the paper as a middle value, the artist modelled the figure with a brush and added accents and highlights with pen and ink. He was to employ much the same technique in his very large *Arm of Eve* (page 49) executed in 1507, probably as a study for his oil painting of *Adam and Eve* now in the Prado.

Dürer discovered charcoal about the same time and it soon became his favorite medium for large portrait drawings and studies of heads. Only a very few of his nudes, however, are drawn with charcoal—and so the Cleveland Museum's *Dead Christ* of 1505 (page 46) is all the more unusual in Dürer's work. One must remember that the charcoals of Dürer's day, like the chalks he employed, were of the natural, blunt, crumbly variety, not the sturdier artificial ones used by today's artists. The monumental conception of this violently foreshortened figure, probably modeled after Mantegna, is deceptive; the drawing is actually very small (6¾ by 9 inches) and the delineation extremely delicate.

Although his letters home to his humanist friend Willibald Pirckheimer were full of humorous banter (the number of Pirckheimer's mistresses was often brought up), Dürer was serious about this second



Dead Christ (1505), charcoal. Despite awkwardnesses, this is one of Dürer's most powerful drawings.

Cleveland Museum of Art, Hanna Fund

Kneeling Donor (1506). A study for an altarpiece, probably a portrait of one of the contributors.

The Pierpont Morgan Library

The Pierpont Morgan Library

Adam and Eve (1504). This was a preliminary study for the famous engraving of the same subject.

Venetian visit, intent on bringing back theoretical knowledge as well as finished work. He made a special trip to Bologna in order to learn the "secret art" of perspective there, and must have had access to Leonardo da Vinci's studies in human proportions, physiognomy and, possibly, anatomy. That he came under the sway of Leonardo, even though briefly, is seen in the drawing of *Four Heads in Profile* (page 44), done about 1513. It is characteristic that Dürer, in the midst of his search for perfect human proportions, was still fascinated by the grotesque and the bizarre.

Although this drawing recalls Leonardo's *Five Grotesque Heads* (c. 1490), the latter is a study in grotesque expressions as well as physiognomies; Dürer shows only the men's profiles, set formally in a row parallel with one another. Here he employed a Northern Gothic expressive device in making deformity serve as a metaphor for evil.

Dürer's fears about returning to his former status in Nuremberg after Venice's adulation were not borne out ("How I shall shiver in the sun," he had written of his home. "Here I am a lord, at home a parasite"). It was true that he still had to argue with his stingy German patrons, but gradually his fame spread until the Emperor Maximilian I took him into his employ.

With the emperor's death in 1519, Dürer entered into a period of crisis. Extremely depressed, he decided to make a trip to the Netherlands, ostensibly to make sure that his pension would be continued by the new emperor, Charles V, but really to sell his work and see the sights. The episode of the whale took place during this excursion, in which he included—for once—his wife Agnes and a maid named Susanna. On this trip he filled two sketchbooks with people, monuments, places, animals and costumes. He often sold these chalk drawings, now numbered among the great art treasures of the world, for one guilder apiece (at trip's end, despite many sales, he came out with a deficit).

The last decade of Dürer's life before his death in 1528, at the age of 57, saw a deepening of his spiritual concerns, further work on his treatises on geometry, fortification and human proportions (the latter was published posthumously), and a series of large, monumental late portraits. In his movingly dramatic *Lamentation* of 1521 (page 51), the artist crowds the figures close to us on the picture plane in a pyramidal composition, eliminating much of the psychological distance that we might otherwise have had. Mantegna's engraved *Lamentation* apparently provided Dürer with the striking motif of the wailing woman throwing her arms up in despair, the V formed by her arms stylistically and emotionally linked with the V of Christ's arms in Grünewald's *Small Crucifixion* (1379), a painting also included in the exhibition.

Taken together, the 36 drawings in the National Gallery provide an unusual opportunity for looking at Dürer's first thoughts and his initial working-out of graphic problems, and comparing them to the many extraordinary prints with which they are juxtaposed. It is a chance to follow a slightly different path from the now rather well-worn road of analyzing his paintings and prints in order to arrive at an appreciation of Dürer's art.

Arm of Eve (1507). Drawn on blue paper, this is a study for a painting of Eve now in the Prado.

Cleveland Museum of Art, Accessions Reserve Fund

Buttercups, Red Clover, and Plantain. If indeed by him, Dürer's only plant study in North America.

Rhode Island School of Design, Gift of Mrs. Margaret Bradley Smith

Lamentation (1521). The Virgin cradles Christ's head, as Joseph of Arimathea pulls taut the shroud.

Fogg Art Museum, Meta and Paul J. Sachs Collection

By Wayne Barrett

The organic way of gardening and its prophet

Jerome Rodale, turning his back against insecticides and chemical fertilizers 30 years ago, now finds honor among youths

A new breed of farmers is digging in the soil. Long-haired, city-bred, under 30, they work experimental plots on campuses or till communal fields. Turning their backs on insecticides, herbicides and chemical fertilizers, they nourish their crops with composts of cattle manure, rotting vegetation and table scraps; and they pile on thick mulches of straw, grass clippings and leaves to crowd out weeds and conserve moisture. They grow foods that they are sure taste better than any they could buy in a supermarket.

"Organic farming is hitting them like it hit me 30 years ago," observes Jerome I. Rodale, elder statesman of health food votaries. Thirty years ago, he bought a run-down farm near Allentown, Pennsylvania, and set out to plant an organic Garden of Eden. He gleaned the know-how from the writings of Sir Albert Howard, English agronomist who had spent half a century proving and preaching organic methods from India to New Zealand. "Sir Albert lit a fire under me," Rodale says. Shedding businessman's garb for work clothes, he laid on natural compost and laid off chemicals. Record yields resulted, just as Howard's book, *An Agricultural Testament,* promised. In one well-composted patch, sunflowers shot up like Jack's beanstalk, towering 15 feet on stems as thick as a man's fist. Motorists pulled off the road to gape. Rodale harvested more than twice the normal crop of seeds and snacked on them all winter. They were the best he had ever tasted, comparing with store-bought seeds "as champagne to ginger ale."

The 60-acre farm became an agricultural testament. Rodale shared its produce with family and friends, but what he really wanted to share—with the whole country—was the organic doctrine. He had the means to do it, for he was part owner of thriving Rodale Manufacturing Company, Inc., an electrical equipment firm, and publisher of a string of magazines, among them *The American Humorist, Health Guide* and *Fact Digest,* the latter having a circulation of some 100,000. Earlier he had worked for the Internal Revenue Service as an auditor.

Rodale dropped all his magazines in order to plot a new one: *Organic Gardening and Farming,* launched in 1942, with Howard in England as a contributing editor. The following year DDT was unleashed, and Rodale, almost alone in voicing opposition, sounded warnings to his modest readership. One early subscriber who heeded was Rachel Carson.

Published monthly at Rodale Press, not far from the farm, advertising-packed *Organic Gardening* now boasts 670,000 subscribers. One measure of its popularity came to light recently at Baltimore's Enoch Pratt Free Library. Copies for the last five years were stolen off its shelves, presumably by an organically oriented thief. Why the surge of interest? Rodale believes that it's mainly attributable to people's growing concern over the environment, for the magazine offers, in folksy terms, self-help ideas that can be put into action without an act of Congress.

A random issue contains articles titled, "Old Leaves Make a Rich Garden Richer," "Recycle Paper and Save the Dump" and "Throw Away That Flit Gun, Mother!" Natural-food gourmet Euell Gibbons, author of *Stalking the Wild Asparagus,* writes a column, usually about weeds that are good to eat.

From "fad" to revolution

When Rodale first sounded his call, critics accused him of promoting a fad. No more. "Now we are treated with respect," he says. Health food stores are popping up like Rodale's sunflowers, and a few supermarkets are giving shelf space to organic items. Some large growers are switching from chemicals to compost to meet the demand. Even colleges and universities, their agricultural programs long subsidized by the chemical industry, are beginning to teach organic methods. The organic "fad" shows signs of becoming a full-blown movement, perhaps one that will revolutionize American agriculture. Rodale does all he can to encourage the possibility.

Bearded, thoughtful, mild in manner, Rodale is still a rebel in his 72nd year. "To every good, new idea," he reflects, "there are three stages—ridicule, discussion, adoption." He experienced the first, triggered

the second and now believes that "we're coming into an adoptive phase." The reason? "The minute a person realizes that pollution is hurting *him*," Rodale emphasizes, "you see some action."

A nutritionist has described Rodale as one who can "see the obvious." With respect to America's population explosion, the obvious, as Rodale sees it, is that it has stopped. In the last ten years, he states, the rate of population increase has dropped by about 35 percent. Ignoring advances in birth control techniques and other factors, he theorizes that the decline is due in large part to the use of chemical additives in food. "They're so soluble," he explains, "they go into every cell of the body, including the genital system. There's more sterility today, more impotency."

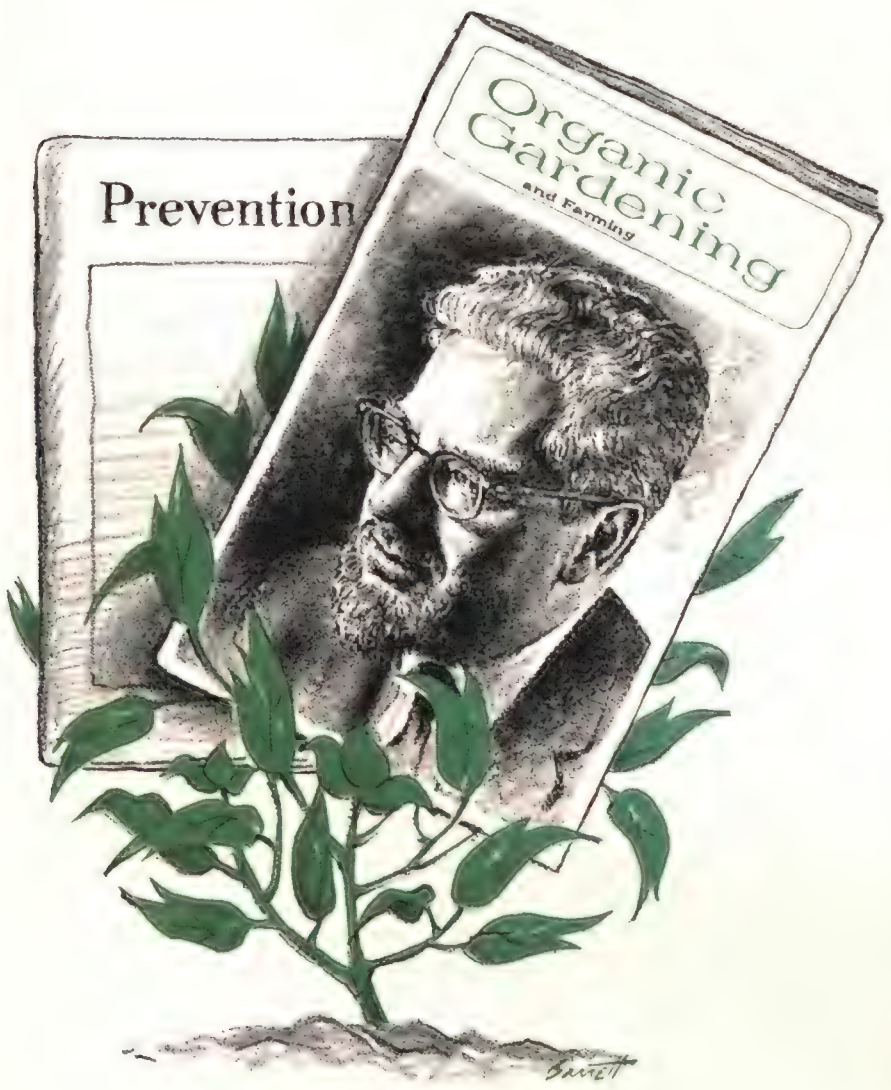
Since the beginning of his organic crusade, Rodale has preached that man must quit killing the soil. "There is a whole society of valuable organisms working to create soil fertility," he says. "To destroy them is to destroy the forces that keep us in good health."

Rodale's farm, untouched by chemical sprays or synthetic fertilizers, affects people profoundly. They see cabbages as big as basketballs, towering stalks burdened with fat ears of corn, tomatoes blushing with juicy goodness. To bite into one is to forever swear off the cellophane-packed imposter. In Rodale's greenhouse, carpeted with spongy natural compost, inch-thick tomato vines that have been fruiting continuously for two years climb to the ceiling. Garden clubbers find it hard to believe that he hasn't dusted his big, decorative flowers with arsenic and force-fed the roots with nitrates.

Standing knee-deep in organic greenery, Rodale admits to sharing his bounty with insects, "but our yields are so great, the loss is minimal." Healthy plants resist insect damage, he claims, quoting his mentor, Sir Albert Howard: "Insects and fungi are not the real cause of plant diseases but only attack unsuitable varieties or crops imperfectly grown. Their true role is that of censors, pointing out the crops that are improperly nourished." Similarly, diseases censor ill-fed livestock. Rodale purposely buys poor-quality cattle —so-called "canners"—fattens them on organic feed, then butchers them. "You can't get better steaks at the best restaurant in New York," he boasts.

His chickens provide meat and eggs equally as good. The secret, Rodale is eager to reveal, is in their environment. They cluck contentedly in a chicken house unusually clean and almost odorless, thanks to another organic wrinkle. The chickens roost on a dropping pit primed with several layers of soil and rotted cattle manure. This culture, rich in bacteria, acts as a deodorizing agent on the droppings, which, as they are digested, provide a continuing source of loamy compost for gardens and fields.

Rodale also "fertilizes" with rocks and tin cans. In 16 Howard cylinders (1/1000-acre garden plots rimmed with low concrete walls), he has experimented with metals as growing aids, coming up with surprising results. For instance, he once planted string beans in all the cylinders, adding cans to four, wire mesh to another four, and cultivating eight plots normally as controls. The metal-enriched areas yielded 50 percent more beans—with higher vitamin content—than the control plots. Rodale borrows from the Chinese in growing vegetables among rocks. He bends to pull up a clump of parsley. Some of its roots cling to a rock, sucking out natural trace minerals, Rodale explains.



Compost dressing lasts for years

Rodale is quick to point out that his farm would not be acceptable to scientists as an agricultural laboratory. "This is just a family farm doing a little experimental work," he says—the kind of operation any farmer could undertake with, Rodale is convinced, profitable results. To arguments that it is prohibitive to prepare enough compost to dress a large field, he replies that one application far outlasts many doses of chemical fertilizers. Besides, composts condition the soil, something chemicals are not designed to do. "You

Organic farmer

put super phosphate on the ground," he states, "and a heavy shower washes it into the water table. Compost may stay in the soil for 20 years."

Rodale thinks that the federal government should test the virtues of organic farming, and has said so many times in print:

"Most of the soils of our country are much reduced in bacterial population and the digestion of soil nutrients thus is not complete. This is such a simple observation and is so true, yet our U.S. Department of Agriculture has protected the chemical idea and fought us viciously. For over 27 years I have been hammering away at the powers that control our agricultural ecology, pleading with them to do some effective research in this field. Our soil is sick, and evidently so are the scientists who have sat smugly by watching the soil lose its structure and its ability to produce healthy plants. They have seen the increase of plant disease and their prescription always has been—use more chemicals, sometimes different and more toxic.

"If the public only knew what they are missing—organically produced food tastes so much better. And don't let the scientists say that chemical fertilizers give higher yields. Come on boys! Let's experiment this thing out and let's see which method produces more abundant harvests."

For a man in his 70s, Rodale betrays few signs of aging. His body is trim, his face almost wrinkle-free and his speech eloquent and easy. He exercises every morning on gym equipment, eats hearty meals supplemented with a handful of synthetic vitamin tablets and roams his green acres. Self-made, self-educated—a short course in accounting at New York University comprised his only college training—he spends much of his working day among his books, many of them medical, and stokes his dozens of file cabinets with gleanings of information for future articles.

Frequently, he settles behind his desk on the second floor of the farmhouse, dips his pen into a bottle of ink, and writes on half sheets of lined paper. He paces himself to a phonograph, interrupting his writing to change a record, or he'll take an exercise break by leaving a reference book in his library, necessitating several trips up and down the stairs.

Rodale not only writes about the state of man's health, he seeks to entertain him with plays—but even in them he gives health a leading role. For example, in *The Hairy Falsetto,* a courtroom farce starring Little Red Riding Hood and company, he has the wolf say: "Your honor, I will prove to the satisfaction of this court that whenever Little Red brought groceries to her grandmother, they were the kind of package goods, heavily loaded with chemical additives, homogenized with insecticides, and fungicides, alkaloids, propionates, polyoxyethylene monostearates, prokylene oxides, methyl bromides and assorted diacetate compounds, benzoate of soda and 2,4-D." To which Grandmother responds, "No wonder they tasted like a pig's behind."

Prevention *nudges one million*

Rodale spends two days a week in New York, where he has an office, and never misses a Wednesday matinee at the theater. Another manifestation of his love for the stage is his semimonthly magazine *Theatre Crafts.* Other publications spawned by Rodale Press since the debut of *Organic Gardening* include the language magazine *Quinto Lingo, Compost Science,* dealing with waste recycling, *Environment Action Bulletin,* a weekly newsletter printed on recycled paper, and *Prevention,* perhaps the most outspoken magazine of any around that tackles controversial subjects.

Launched in 1950—circulation is now 940,000 and counting—*Prevention* takes up where *Organic Gardening* leaves off, in the home, specifically in the pantry and refrigerator. Typical of its bareknuckle editorial approach is a Rodale article titled "Don't Eat Bread." Citing evidence extracted from medical journals, which traces the source of many illnesses to the gluten in wheat and, to a lesser extent, rye products, Rodale pronounces "breads, cakes and other wheat-containing foods unfit for human consumption."

Another favorite target is refined sugar, which he thinks ought to be outlawed. He even wrote a book on the subject, *Natural Health, Sugar and the Criminal Mind,* in which he links sugar to a host of physical and mental ills. Much of today's crime in the streets, he suggests, may be due to delinquents overloading their diet with soft drinks, ice cream, candy and pastry. Hitler, he writes, was a typical example of sugar addiction. Referring to William L. Shirer's *The Rise*

and Fall of the Third Reich and Ernst Hanfstaengl's *Unheard Witness,* which revealed that Hilter sporadically gorged himself on whipped-cream cakes and put sugar in his wine, Rodale concludes that he was a "sugar drunkard." Rodale thinks maybe Napoleon was too. A famous confection was named after him.

While taking aim on processed foods spiked with preservatives and artificial flavors, Rodale realizes that, supermarkets being what they are, the public is forced to buy these foods. This is where the "prevention system," as he terms it, enters the picture. Its message is take your vitamins—lots of vitamins. Processing robs foods of them, and even if manufacturers put some back, they are seldom derived from natural organic sources. So-called "minimum daily requirements" (M.D.R.) are cruelly deceptive, he claims, and should be increased, particularly standards for vitamin C. Long before Nobel prizewinner Linus Pauling made headlines—and triggered a run on drugstores—by asserting that massive doses of synthesized vitamin C knocked out colds, Rodale was writing in *Prevention* that people should take at least ten times the recommended minimum. He himself takes 3,000 milligrams a day, 100 times the M.D.R., and he has for years. He can't remember when he last had a cold.

One thing he emphasizes to his readers is that vitamin C helps the body excrete chemical residues. When a gas-station attendant complained of chronic headaches, Rodale surmised they might be caused by breathing toxic fumes. He advised the man to try vitamin C. The man did. The headaches disappeared.

The growth of the vitamin industry stems largely from Rodale's crusading. He practically created the industry, building it over the years "brick by brick," he says, by editorializing that such natural substances as rose hips, for vitamin C, bone meal, for calcium and dolomite, for magnesium, should be packaged in tablet form. Vitamins and minerals had long been used as supplements in animal feed. Why not for man?

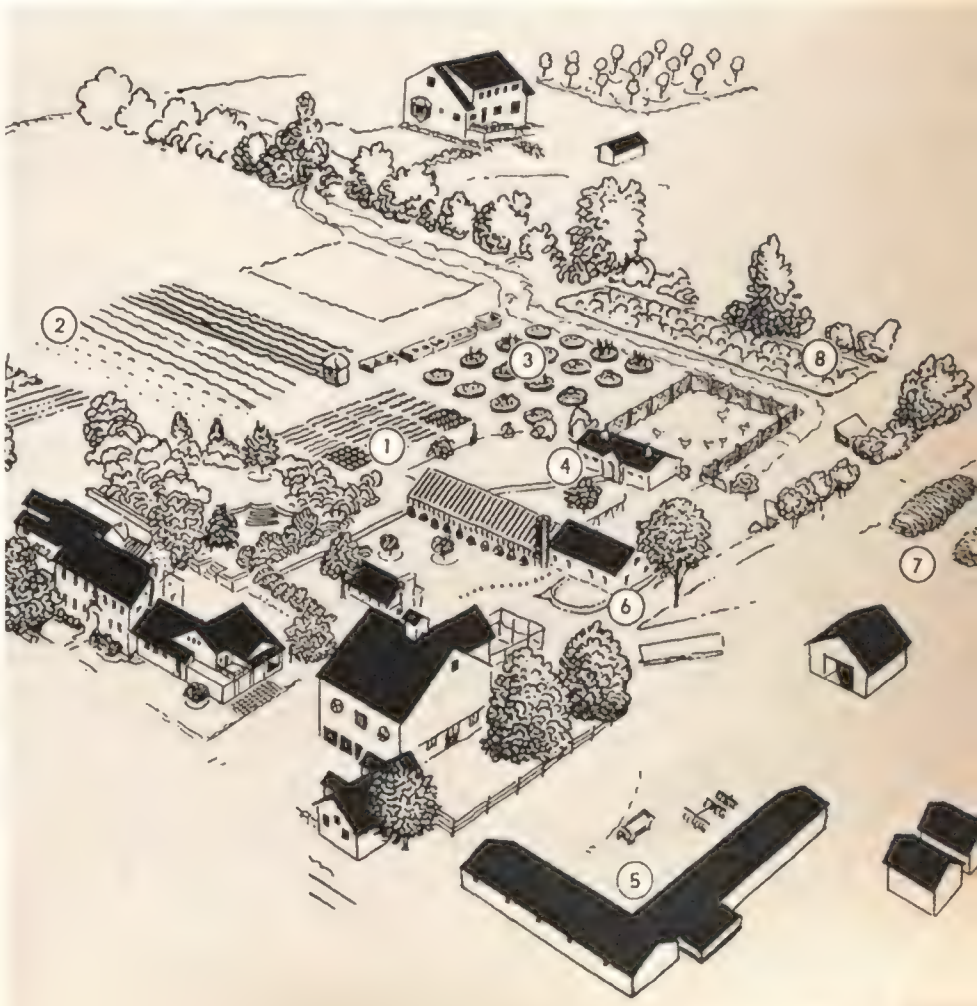
Rodale wouldn't think of letting a day go by without swallowing a couple of bone meal tablets. Bone meal, he says, prevents cavities, regulates the pulse beat and gives resiliency to bones. One night, while going downstairs to fetch a book, he accidentally put it to a test by missing a step and falling. "I laughed all the way down because I was taking bone meal and nothing could happen to me." Nothing did. An idea pops into his mind as he reminisces—and will doubtless pop up again in *Prevention*. "Why don't they sell bone meal at these ski places?"

Rodale zealously guards his health. When he and artist wife Anna travel—which is often and far-reaching (the Soviet Union last year)—they seek out organic foods and drink bottled spring water. Tap water laced with fluoride, chlorine and other foul-tasting additives, Rodale deems potentially lethal. And the common drains that funnel everything from dishwater and raw sewage to toxic factory wastes into public water supplies is a system he considers worse than barbaric. Why not have separate outlets for poisons, he wonders, the same as separate faucets for hot and cold water? In his own swimming pool he pasturizes the water with ultraviolet equipment, thus requiring only "a pinch" of chlorine to curb bacteria proliferation. In his pool your eyes don't smart. Prevention for Rodale even extends to the knives and forks he uses. They're gold-plated, requiring no polishing. Silver polish, he cautions, is toxic and hard to wash off.

Rodale now takes it easy—by choice, not necessity. He still writes copiously and has stockpiled enough material, he says, to keep him busy for another 50 years, but he has turned editorial reins over to son Robert, who shares his father's zest for life as well as the happy environment of the Rodale farm. Last year Robert ran an article in *Prevention* titled, "We Should Live To Be 150!" His father subscribes to that. "I'll live to reach at least 100," he predicts—"unless I'm run down by a sugar-crazed motorist."

Maryland free-lance writer and artist Wayne Barrett spent many years as an editor at National Geographic. *His drawings appear in the* Wall Street Journal.

Rodale's farm packs many experiments into 60 acres:
1) stone mulching; 2) family vegetable garden;
3) mineral mulching plots; 4) chicken dropping pit;
5) equipment sheds; 6) office and greenhouse;
7) compost piles; 8) rose hips and *rosa rugosa.*



Hours after emerging from its nymphal shell (right), a cicada has changed from light to dark, soft to hard, and is ready to seek a mate. Magnification here is four times. For sequence see pp. 62-63.

By Karl V. and Dorothy B. Krombein

From nymph to noise to nymph again, the cicadas all take their time

After years underground, some periodical cicadas will emerge for a noisy blast this spring—and next spring—and the next—

"There was a numerous company of *Flies,* which, were like for bigness unto *Wasps* or *Bumble-Bees,* they came out of little holes in the ground, and did eat up the green things, and made such a constant yelling noise as made all the woods ring of them and ready to deaf the hearers."

This was the English colonists' first experience with the periodical cicada, recorded 35 years after the fact by Nathaniel Moreton in his book, *New England Memoriall,* printed in Cambridge, Massachusetts Bay Colony in 1669. To 1970 residents of the Washington, D.C., area and much of the northeast quarter of the United States the words strike an unpleasantly familiar chord. This summer, and each summer to come, in various parts of the eastern United States, the woods will "ring of them" again.

Although other early accounts call these insects locusts, and they are still commonly so called in many parts of the country, the cicada, a sucking insect related to aphids or plant lice, is actually a very different kind of insect from the locust, with its chewing mouth parts, which is a kind of grasshopper.

For most people in the northeastern United States in the summer of 1970, the sudden eruption of the 17-year cicada was an annoyance if not a nightmare.

Dr. Krombein is chairman of Smithsonian Institution's Department of Entomology and is a specialist on wasps and bees. His wife and coauthor, Mrs. Krombein, is also a naturalist.

But for entomologists, it provided a splendid opportunity for research (see box on page 61). We were able to observe an important segment of the cicada's life cycle in the most convenient of locations—our backyard in a Washington suburb.

Unseen and unheard since late spring in 1953, hordes of infantile cicadas, white hatchlings about a tenth of an inch long, had been living beneath the soil, sucking nourishment from tree rootlets. Seventeen years later, early in the spring of 1970, each mature nymph had dug its way upward to the soil surface and then retired four to six inches below ground level until the time to emerge and transform into an adult. In mid-April we noticed the first open hole, half an inch in diameter, where the roof had fallen in on a nymph resting below.

Yard chores gave proof that the mature taffy-colored nymphs had been at work all under the yard. Below the mulch covering the ground at the base of trees, there were many holes which ended at the surface with a raised collar of soil to keep out rain runoff. Spading into the ground uncovered innumerable vertical burrows four to six inches long, each with a nymph braced against the sides of the burrow. Their instinct to prepare for emergence was so strong that where obstructions such as rocks or boards blocked the way up, the nymphs dug long horizontal burrows around them.

The spring of 1970 was cool and rainier than usual. In areas of the yard which were open to the sky many nymphs had built capped mud turrets above ground level; these seemed to perform the function of keeping out flooding groundwater or rain. When we removed some of these turrets, the occupants were usually resting at ground level and they scurried down into the burrow. Never did we find an occupant in the turret itself. When a turret was removed, the resi-

dent nymph would make a partition of soil across the burrow exit at ground level—instead of reconstructing the turret.

After what seemed like interminable waiting, we saw the first nymphs emerge from the soil between 10 P.M. and midnight on May 20 with air temperatures ranging from 69 degrees to 64 degrees. Hundreds of nymphs climbed out of their burrows and crept toward some upright structure—a tree or shrub, even up the walls of our home. Firm placement of the nymphal feet on some roughened surface was essential to complete the transformation successfully because the horny nymphal skin becomes the launching pad for the adult stage. A few nymphs got their signals mixed and transformed on our clothesline.

With each succeeding night, the population increased until on May 25 so many nymphs were astir we could hear the rustling of their feet among the leaf mulch beneath our trees and shrubs. However, the night of May 27-28 was chilly, 56 degrees at 9 P.M. and as low as 42 degrees at 6 A.M., and there was no perceptible emergence. On May 28 a few emerged at 9:30 P.M. with a temperature of 58 degrees, and there were similar small emergences on the evenings of May 30, 31 and June 1. Again on June 2 there was no emergence but June 3, despite a heavy rain, produced a final small population. Thus the total emergence occurred over a period of 15 days.

The deafening chorus begins

We picked up 20 nymphs as they emerged from the soil on the evening of May 21 and put them into the refrigerator to retard their transformation. Next morning at 10 A.M. with an air temperature of 74 degrees we placed all of them on a shaded tree trunk where they began to transform immediately. Not one nymph transformed properly, some being unable to shed the nymphal cuticle entirely, others being unable to expand the wings fully to allow for flight. Perhaps the lower temperatures and increased humidity of nighttime are essential for successful transformation, but it is possible that the chilling may have upset the normal sequence of processes involved in successful transformation.

At 6 A.M. on May 23, less than three days after the first adult emergence, we first heard a chorus of males singing around our home. For the next couple of weeks, while mating took place, they kept up an incessant din during daylight hours. Contrary to some published reports that cicada singing is an exclusively daylight activity, our cicadas sang occasionally at night. A friend in nearby Alexandria, Virginia, told us of hearing cicadas singing after midnight before May 17, and at our home we heard choruses at 2 A.M.

Several days after transforming into adults and having found each other in the deafening chorus, a pair of cicadas (female above) mates on a mountain laurel.

some days later. By June 9 the singing was much diminished, and four days later the last serenade for a mate was heard.

The 1970 cicada population in Arlington County, Virginia, was less noisy and must have been smaller than its predecessor in 1953, probably because so much of the soil surface in Arlington has been disturbed by widespread construction of roads, shopping centers and homes. Removal of trees deprived nymphs of rootlets to feed on, and the paving of large areas prevented the emergence in 1970 of many nymphs which might have found sustenance on roots penetrating beneath paved surfaces. Such typical environmental changes of recent times, added to early efforts to clear large forested areas in the eastern and central United States, have probably so damaged small broods of cicadas over the years that they are extinct.

The female cicada excavates its nest by thrusting her curved, egg-laying organ called an ovipositor repeatedly into a twig, fraying out the fibers into a fan-shaped protrusion beneath which is a V-shaped cavity consisting of two pockets. She places her slender eggs (about 2.8 mm long and 0.5 mm wide) into these pockets one at a time. Eventually each of the pockets contains two rows of eggs, side by side, with six to eight eggs in each row. To accommodate the 400 to 600 eggs that she lays, the female makes a number of such nests in a linear series, usually on the underside of a twig. The frequent result of this excavation is that the twig breaks and hangs downward, its foliage with-

Visible in this split-open dogwood twig is one of the many nests the female cicada digs to house her 400- to 600-egg contribution to the next generation.

ering and turning brown—a woeful flag for the owner of the tree or shrub. Little wonder that a 17th-century chronicler believed cicadas "poyson'd" the trees.

Although our adult cicadas had been active for ten days, we saw no signs of ovipositing until May 30 when we noticed the first "flag" on a dogwood. Some observers have noted females nesting during the daytime, taking 25 minutes to construct their nests and lay their eggs, but we never caught a female in the act. Indeed there was little evidence at all of such activity taking place in the daytime, and we suspect that as in the case of emergence, much of the egg-laying takes place under cover of darkness when the cicadas' natural enemies are asleep.

Perhaps the primary enemy of the adult cicada are birds and more often than not we saw robins, mockingbirds and English sparrows attack more of them on the ground than in the air, in spite of the fact that cicadas, with their long bodies, are clumsy fliers. Historical reports mention that poultry and swine fed upon them and our two dogs quickly learned to search the low branches of shrubs or the bases of trees for resting cicadas. It is likely that small mammals—raccoons, skunks and opossums—enjoy them as well. Those mature cicadas that were not preyed upon died a natural death by the middle of June.

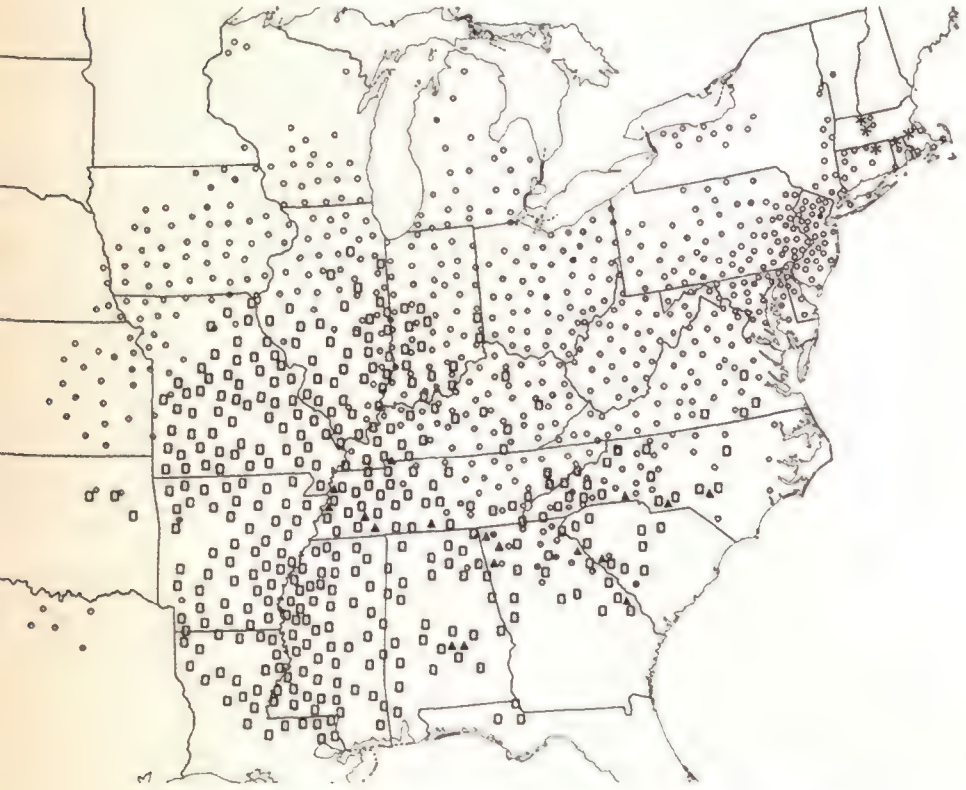
After the females had oviposited, the eggs developed in the branches in our yard for six to seven weeks, and the tiny cicadas formed two sets of clothes under their shells. Hatching is a two-step process: The first-stage nymph which has only vestigial, and nonfunctional mouthparts and legs emerges from its separate egg shell in the tightly packed mass of eggs. Then, shedding the first-stage cuticle almost immediately, it becomes a second-stage nymph with functional mouthparts and legs—a form recognizably similar to the mature nymph that will emerge from the soil 17 years later. The second-stage nymphs move rapidly along the twig until they fall off to the soil below.

After the outermost nymph in the nest had left its shell, its brothers and sisters followed in such quick order that it was difficult to keep them under observation and we were unable to follow them after they fell off the twigs. Other observers have reported that the nymphs do not burrow into the soil but rather slip into crevices in the ground or into loose soil, eventually to find a tree rootlet from which they can suck their sustenance until, years later, it is time to burrow up to the air.

With thousands of these insects underground sucking sustenance from tree rootlets, one may wonder if the trees suffer, but there is no evidence that they do. Above ground there may be very extensive and severe pruning of large trees from oviposition, but they seem to recover quite rapidly. Small nursery stock, however, may be so severely damaged by the egg-laying activities that trees are killed, and fruit trees may suffer a considerable reduction of yield.

On the positive side, many months later, the six-inch emergence burrows in our yard still provided

Waiting for the right moment to emerge, a nymph may build a turret over its burrow (shown here cut away) as a defense against heavy rains.



Throughout the eastern United States, the silent hordes wait underground for their appointed year. ○ indicates the broods of 17-year cicadas. □ indicates 13-year broods. This spring, a 17-year brood (*) and a 13-year brood (▲) will emerge.

runnels for rainwater, ventilating shafts to aerate the upper soil and an avenue for incorporating organic matter. Cicadas are, however, unwelcome close companions. Although the adult cicada neither bites nor stings, its spiny, spurred feet can tangle in one's hair or rasp one's skin or clothing.

And, of course, there is that drowning chorus which will return to our yard again in 1987, as predictably as clockwork.

The comings and goings of the cicada have been observed for almost 340 years. By the late 19th century, enough information had accumulated on the periodicity of broods in various parts of the eastern United States that entomologists developed a system of brood nomenclature in which each brood was given a number. For example, the cicadas of the 1970 emergence belonged to what is called Brood X. Though some may now be extinct, there have been 17 labeled broods (I-XVII) of the 17-year cicadas in the more northern states and broods XVIII to XXX of the 13-year cicadas in the more southern states. However, a number of the postulated 13-year broods are not

A constant yelling noise at Princeton

While the Krombeins carefully observed the life cycle of the cicada in their Arlington, Virginia, backyard, researchers at Princeton University took advantage of the 1970 influx to analyze the racket the cicadas were making on that New Jersey campus.

Led by James A. Simmons, a research fellow at Princeton's Auditory Research Laboratories, they measured the noise near a tree where thousands of cicadas —predominantly of the two main 17-year species, *Magicada septendecim* and *Magicada cassini*—had gathered. Sixty feet from the center of the noise, its intensity was clocked at between 80 and 100 decibels—about the same as a screeching subway train or a jackhammer. That is sufficient to damage permanently the eardrums of some mammals, and it is possible that the combined noise of the two species may serve "cooperatively" to drive away predators.

How effective a deterrent the noise really is Dr. Simmons does not know, but he reports that whenever he and his colleagues were monitoring a large group of cicadas, "birds and every other visible moving thing, including people, simply left the area."

The cicadas themselves are spared most of the racket. The two species operate on different frequencies and one cannot hear the noise produced by the other. Not only that, the researchers at Princeton found that just before a cicada begins to produce its own noise, a muscle collapses its eardrum, reducing the insect's ability to hear to 25 percent or less for the time the noise is produced.

And so, having attracted a mate of its own species, and while the deafening din goes on around it, the cicada mates in peace and relative quiet.

known to exist; others are now very small or extinct.

We can only speculate as to the origin of the known broods. Part of a widespread brood might emerge a year early or late because of unusual local climatic conditions, or, perhaps because of changes in vegetation cover or topography. If an advanced or delayed population had successful progeny which resumed a normal 13- or 17-year cycle, it would result in the establishment of a new brood out of synchrony with the parent brood. The restricted distribution of some of the small broods creates a very strong suspicion that they may have originated in this way from some of the more widely distributed broods.

The periodical cicada is a natural phenomenon unique to the eastern United States (except for one old, questionable and unconfirmed, record from Quebec), where it occurs east of the 100th meridian, which approximately separates the more humid eastern part of North America from the more arid western part. There are areas of overlap between the 13- and 17-year broods, so that during certain occasional years an unusually large emergence may take place in restricted parts of the range of two broods.

Although there are numerous species of cicadas in North America, the genus *Magicicada* consists of six distinct species: *septendecim, cassini* and *septendecula* in the 17-year broods and *tredecim, tredecassini* and *tredecula* in the 13-year broods. Each species is distinguished by the "song" of the males, by certain minor differences in color or anatomy and by the different ecological niche which each prefers. For example, *septendecim* occurs commonly on a wide variety of trees in upland wooded areas, *cassini* in bottomland woods and *septendecula* on hickories in upland areas. In 1970, we saw a very few individuals of the smaller *cassini* and *septendecula* at our home in Arlington, but all of our observations and photographs were of the extremely abundant and somewhat larger *septendecim*. *Cassini* was very abundant in the nearby Potomac valley of Maryland, but we saw no large populations of *septendecula* in the Washington area.

Periodical cicadas which will emerge in 1971 will be fewer in number than in 1970. There are scattered small colonies of Brood XI in Connecticut, Massachusetts and Rhode Island, and scattered small colonies of Brood XVIII in North and South Carolina, Tennessee, Alabama and Georgia.

The next large cicada emergence will be that of Brood XIX in 1972 which will occur over much of the southern United States extending into southern Illinois and northern Missouri. The year 1974 will bring to us the 20th generation of Brood XIV since it was first observed by the Pilgrims in 1634; it occurs from eastern Massachusetts west to Illinois and southward through the Ohio River valley and the Allegheny Mountains to Tennessee and western North Carolina. Brood XXIII will emerge in 1976 in the Mississippi River valley from southern Illinois, Indiana and Missouri south to the Gulf.

The largest brood of all (X), which we observed in 1970, will not return until 1987 when we can expect to entertain the droning hordes in three separate areas: Long Island, New Jersey, southeastern Pennsylvania, Delaware, Maryland, northern Virginia and eastern West Virginia; western Ohio, southern Michigan and Indiana; and western North Carolina, eastern Tennessee and northern Georgia.

One can plan on it.

Newly emerged from the soil, a nymph has begun its nocturnal metamorphosis. The skin has split showing the pale adult within.

About 25 minutes later, the transforming adult arches its body out in a horizontal position. Its legs are still not free of the nymphal skin.

After a half hour, the adult is free of the skin and rests beside it as its wings expand. Opaque section at wing tip will expand more.

Eight minutes later the wings are fully expanded. By the next morning, the insect's body will have hardened and also darkened (see page 56).

Twelve year-olds build a city

Smithsonian Resident Young Associates become town planners, experimenting with new concepts and imaginative building designs

"Remember, you're future people. You're not here-and-now people. You may not want to build a city as you know it today." With that admonition, architect Frank Gehry led a group of 11- and 12-year-olds into an experiment in city building, sponsored by the Smithsonian Resident Associates. The series of two-and-one-half-hour workshops was designed to make young people aware of the problems of city planning.

"Kids don't think that they are allowed to criticize grown-up things, but they should ask questions and have opinions," Gehry explained. "Our program lets them get involved. I make them all city planners."

To help free their imaginations, they were also told that the cardboard mountains contained purium, a mythical substance that makes all trash biodegradable, and they could mine it or not as they chose.

First the groups discussed the aspects of a city that they wanted to avoid. The young people pictured here listed crowds, slums, private buildings, cars and pollution—noise, visual, air and water. What they did want were shelter, industry (they decided that they would mine the purium), a civic/cultural center, governmental educational and medical facilities, utilities, shopping places, transportation and open spaces.

The group was divided into two teams, each to develop one side of the river—a band of plastic—and two water officials were elected with total authority over any decisions that might affect the river or lake it drained into. A preliminary design was drawn and then they were ready to build.

A number of imaginative buildings soon began to appear, most cut out of Styrofoam. Many rose on stilts to leave trees and park areas below untouched. A large balloon with paper-cup appendages was added to an apartment complex that spanned the river. Some buildings were suspended over the city, never mind how—this was a *future* city.

"I don't want to impose preconceived notions of cars or parking lots or green space on the kids," Gehry said. "They are already given too many predigested ideas. Trying to teach them from our experiences is not only useless but detrimental. After all, it's our notions which have created the present chaos."

So the youngsters experienced their own problems. The water people turned out to be tough conserva-

tionists. They allowed two transportation tunnels to be built under the river and they authorized utilities and a sewage treatment plant (making use of purium) to be constructed beneath the lake. But they held the line on pollution and kept the surface free for recreation. A heated argument arose over the anchoring of a guy steadying the television station floating over the lake. A water official conceded that he couldn't veto the station because it wasn't touching the water but his lake was not to be defiled with a guy. He won.

"We just got a telegram," announced Gehry, "saying 20,000 people are arriving by plane tonight and we have to have houses for them." Thus the group was shown the pressure placed on burgeoning cities. "One of the women on the plane is going to have a baby as

Before the start of the project (above), class members gather around the city site, bisected by a river. Architect Frank Gehry, surrounded by children, helps them evaluate their project.

Joanne Miller consults with Gehry on placement of cardboard-tube tunnel under the river.

soon as she arrives. Where's the hospital?" A hacksaw was hurriedly employed to get one under construction.

Gehry has been involved in city planning in Newburgh, New York, and Hermosa Beach, California. He first developed the workshop in Los Angeles with ghetto children. "They didn't have the scientific information this group has but they felt freer to fantasize," he said. "Doing this has to be fun for them, so that they will associate planning and design with a good experience. What is fun and good is easy to remember."

Doreen Nelson, Gehry's sister assisted with the Smithsonian workshops. Her own grade school class in Venice, California, spent six months on a city-building project that was exhibited in the Los Angeles city hall rotunda. They are now working with their city as scientists and economists learning how to make it run.

Time was finally called on the Smithsonian workshop and the class gathered to evaluate their creation. They hadn't avoided crowding but there were no slums and they had kept private buildings to a minimum. The masking-tape monorail was a definite plus; they all felt it was worthwhile to keep cars out. Thus they scored well on escaping air and noise pollution. They also scored themselves high in avoiding water pollution and gave full credit to the water officials: "They managed to preserve the water and didn't let us ruin it," said one youngster.

They didn't fare as well on visual pollution. They forgot that power lines could go underground and they built too many big buildings. "I would say, as an architect, that you did not bad—half-and-half," Gehry told them.

What to do with the mini-metropolis? Keep it? Put it in the museum? Then they took another look. "Tear it down," they cried and it took seconds to undo two hours, worth of work. But the experience will last.

Down comes the city at the project's end. "Look at all the pollution!" someone shouts.

Young planner Rolf Lundberg places monorail of masking tape between the city's trees.

Educational Expeditions International in cooperation with the Smithsonian Institution is pleased to offer a new educational adventure to Smithsonian Associates.

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- **Gibeon** An 18-day field survey and search for Gibeon meteorites in Southwest Africa. Chief Scientist: Dr. Vincent Manson, Curator, Department of Mineral Sciences, American Museum of Natural History, New York, N.Y. Cost $1875./27 July-13 Aug.
- **Mbangombe** A 20-day archaeological excavation of a prehistoric Iron Age site in Zambia, Africa. Chief Scientist: Dr. David Phillipson, Inspector, Historical Monuments Commission, Zambia. Cost $1975./12-31 August

Each expedition is limited to 25 participants. Please specify which expedition you are interested in when replying to:

Educational Expeditions International, P.O. Box 127-S, Belmont, Massachusetts 02178.

Book reviews

Yamsi
Dayton O. Hyde
(Dial Press, $7.75)

High in the Oregon hills lives a rancher with a wife, five kids, assorted wild pets, a mortgage and a river of trout in his basement. He is Dayton O. Hyde, ecologist and author of *Yamsi,* a warmly engrossing account of an average year on the Yamsi Ranch at the headwaters of the Williamson River.

Dayton Hyde shows us the birth, life and sometimes death of wildlife at war with a world terribly polluted by man. No more will we view the graceful sweep of the peregrine falcon—soon DDT will have made it extinct. Naturalist Hyde was instrumental in saving the sandhill crane from oblivion, but eloquently writes of greater dangers in store for other endangered species.

Our own Forest Service is a major culprit. With "more engineers than foresters," it hacks out unneeded roads that can become rivers of mud in spring rains. Each mile of road removes more than *seven acres* of land from productive life; animals lose food and shelter, ranchers lose watershed and grazing lands.

Writes the author: "So much do we associate Smokey the Bear with . . . making people aware of forest fire dangers, that to criticize him is almost to be against motherhood. . . . But many a conservationist and wildlife manager is now having second thoughts about poor Smokey. Oddly enough, his policy of fire prevention itself has evoked much criticism. . . ."

Forests once took care of their own brush problems; fires that began naturally seldom harmed trees as they devoured the clutter of brush and debris on the forest floor. Now such combustible residue is everywhere—because man extinguishes all fires even though some could perform a useful task by being allowed to burn.

There are other enemies. Rustlers in modern trucks use the network of roads to flee farther and faster than their early day counterparts; they can cost a rancher $15,000 a year and bankrupt him. Low-flying planes drop pesticides or animal poisons unannounced, and kill far more than varmints or insects. One victim: Hyde's English setter.

Worst of all are unscrupulous hunters, many of whom should not be allowed guns. Even riding to check on cattle can be a deadly dangerous chore during hunting season. The author writes of one experience: "Keeping to the open meadows, we ride the length of the valley. It is not a pleasant feeling. I see a man sitting on a log, watching me through the scope of his rifle."

Hyde and other ranchers know the game must be harvested, but the annual blood-bath, the crippled, suffering creatures left to bleed out their lives—these have turned him against hunting forever.

But life isn't barren of humor at Yamsi, whether it's a case of being bucked off by a horse or butted by a cow. Once, running with arms wide and flapping to show adopted fledgling cranes how to fly, Hyde ran straight into his visiting banker, who was watching him with a worried expression.
—*William Childress*

The Sun Beneath the Sea
Jacques Piccard
(Scribners, $12.50)

It is discomforting to be critical of a book by Jacques Piccard of the famous ballooning family. His contributions to ocean engineering in particular, and his activities towards increasing public awareness about the oceans in general, have been important to the steady, slowly increasing growth of marine sciences.

The Sun Beneath the Sea is an account of the 30-day drift in the Gulf Stream by the Piccard-designed "mesoscaph" (medium-depth submarine) *Ben Franklin.* Piccard and a crew of five representing the Grumman Aerospace Corporation (owners of the *Ben Franklin*), the U.S. Navy and NASA (cosponsors of the cruise) began the drift on July 14, 1969, off Palm Beach, Florida, and returned to the fresh air 30 days and 1,500 miles later at an open ocean point roughly 500 miles from Portland, Maine. The cruise was designed to provide information for NASA on problems of habitability in a stress environment, paralleling the situation which may be found in a spaceship, and also to provide oceanographic and acoustical data to the Navy, as well as to evaluate the basic performance of the mesoscaph itself. For all intents and purposes these objectives were attained and the mission can be called a success.

Unfortunately, a successful mission does not necessarily result in a successful book. The story begins with an account of the mesoscaph *Auguste Piccard,* the predecessor of the *Ben Franklin.* This account is a largely vitriolic attack on anonymous persons associated with the planning and management of a Swiss Exposition for which the *Auguste Piccard* was built. Piccard's attack on one protagonist, referred to as his "Judas," raises the question of the author's view of his own position in the world.

With the preliminaries over, Piccard describes the building of *Ben Franklin,* its preparation for the drift and the trip itself. Piccard's shipmates are treated superficially throughout the book, a single chapter of four pages is taken to describe their characteristics, both as human beings and as technical experts. Occasional hints of friction associated with varying musical tastes (a tape recorder piped a diet of music including "The Yellow Submarine" throughout the ship) and other foibles of human character inevitably surface. These are only anecdotal, however, and we really learn very little about the men and how they were selected. Why, particularly, when so much of the value of *Ben Franklin* comes because it is an observation post in the sea, was a biologist not part of the crew?

In terms of accomplishments, Piccard admits to the absence of sensational discoveries. He also suggests that the millions of data points obtained during the cruise are still in the process of analysis, thus making an evaluation of scientific gains impossible at this time. It does seem clear, however, that with the exception of the NASA studies, virtually all other scientifically meaningful measurements made during the Gulf Stream drift, could have been made more effectively and less

expensively from surface ships or aircraft.

Piccard is an engineer, not an oceanographic scientist, a fact attested to by a number of unimportant but annoying errors (the device used to determine temperature at different depths is a bathythermometer; the record it obtains is a bathythermograph). Perhaps some of these are a fault of the translator.
—*William Aron*

Highways and Our Environment
John Robinson
(McGraw-Hill, $24.50)

In the beginning, man moved along footpaths and, later, buffalo trails and wooden planks. He picked wildflowers by the road or shot quail for dinner.

Then came his motor car. And suddenly, he began savagely slashing a path leaving huge scars through beautiful forests and fertile fields, smothering the earth with concrete, putting up plastic-looking landscapes of hotdog stands and billboards. The sky grew dark and the cities filled to choking.

A nightmare? It's one we've created and now live with. Says John Robinson, "The inescapable fact is that the automobile, while evolving into a sleek, luxurious thing of beauty, has degraded the environment it dominates to a degree all rational people . . . question."

He traces the path of roads from ancient days to the present, dealing with the unfortunate outgrowths—urban blight, litter, the damaged land. But although the book catalogs the disaster, it also makes suggestions for dealing with it.

Specific chapters on national parkways, recreation roads, pedestrian malls and design concept teams, offer concrete suggestions for improvement, both of the physical conditions we have imposed on the land and the mental ones we've placed on ourselves.

The author notes that his book is an outgrowth of a series of articles he did on highway landscaping. In conversion, it contains a weakness. Some of the transitions are rough and certain chapters contain repetitive material from others. The reader may wish the passing treatment of public or mass transit had been as complete as other sections.

Otherwise the book is valuable as a guide to improvement of the problems of highways coexisting with our land. The appendix gives examples of states which

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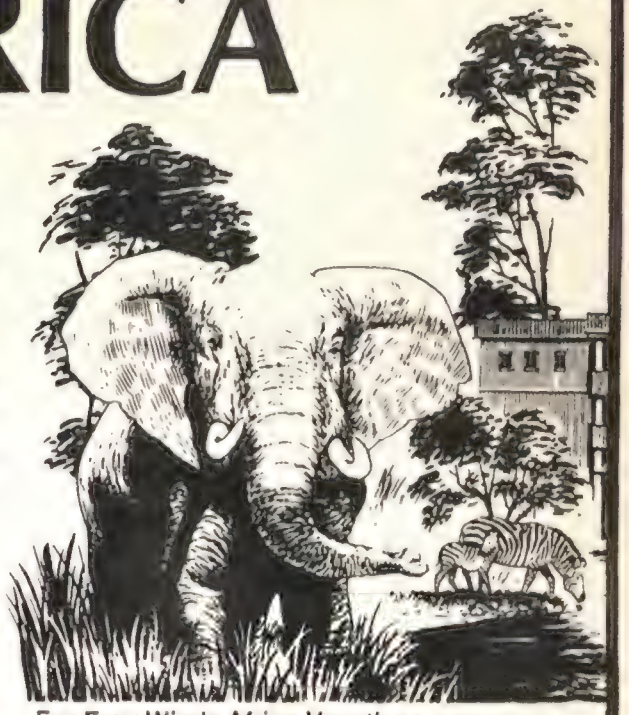

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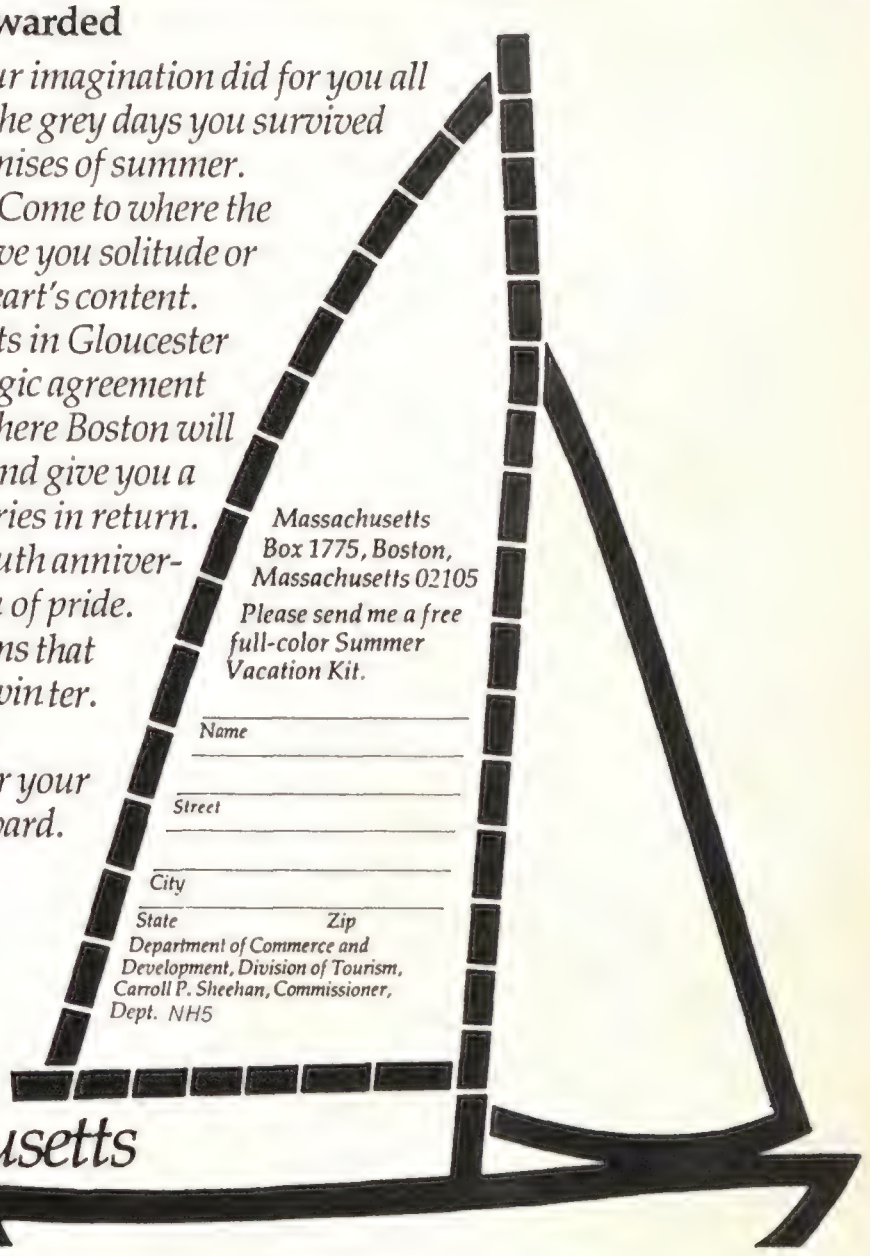

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Foreign Tours

"No-Tour" Tour: Excursion fare from Dulles airport to Paris and return. Members arrange their own travel in Europe—May 26-June 16.
Scotland, Wales and Ireland: Visits to private estates in co-operation with Irish Georgian Society and Scottish National Trust—May 31-June 22.
Roman Archaeology: Inexpensive tour for students, teachers and parents to Rome, Naples and Sicily—July 1-22.
"No-Tour" Tour: Departs from New York for Vienna, with paid overnight stay in London—July 15-August 5.
South America: A 21-day tour of Colombia, Ecuador, Peru and Brazil with emphasis on archaeological sites and architecture—August 4-25.
"No-Tour" Tour: Round trip from Dulles International Airport to London. Members arrange their own travel in Europe—September 9-30.
Russia: Unusual tour includes Samarkand, Kiev, Vladimir, Novgorod. Second section—October 25-November 19.

Domestic Tours

Strawbery Banke and Portsmouth, New Hampshire: A tour of the restoration project at Strawbery Banke; also tours of private and public homes outside restoration area—May 23-26.
Paleobotany Collecting in Nova Scotia: A six-day collecting-and-study trip to the unusual fossil-bearing coal seams and high tidal flow area at Joggins—June 21-26.
Apollo 15 Space Launch: A four-day trip to witness the Saturn V launching of Apollo 15 to the Moon. Tours include NASA facilities—August 9-17.
Cascade Volcanoes: A nine-day inspection tour of the recent geologic history of Mt. Hood in Oregon and Mt. St. Helens in Washington, with attention paid to the recent basalt flows and lava tubes—August 9-17.

have not sacrificed scenic beauty and conservation to highways. Robinson also lists the names of the "Highway Establishment" lobbies in Washington.
—Jane Hoyt

Bird of Jove
David Bruce
(Putnam, $5.95)

Where the Soviet Republic of Kirghiz meets China, the Berkut, royal eagle of the ancient Tartars, wheels and screams in lonely freedom. This mighty bird with its more than nine-foot wingspread and four-inch-plus talons hunts its prey among the craggy peaks and slopes that rise above the waters of Issyk-Kul. Attacking at speeds of better than 120 miles an hour, it shreds deer, wolves, bears and tigers with its steel-sharp talons.

Largest and fiercest of the golden eagles, the Berkut formerly was the hunting bird of the czars, Genghis Khan and Saladin. Death was the penalty for anyone other than an emperor who hunted this legendary Bird of Jove, said to hold thunderbolts in its talons. Hardly a companion for ordinary man, but Sam Barnes, a spirited Lancashireman, brought a Berkut across Europe to Wales and tamed and trained her.

His story, told by David Bruce, follows an old pattern: the strengthening bridge between a man and a beast, the developing bond of love and trust. But Barnes' struggle with his bird, Atalanta—every bit as capable of tearing him apart as the lioness, Elsa, in Joy Adamson's *Born Free*—differs in that this proud golden-feathered eagle was removed from her natural habitat by almost half a world to live under near-suburban conditions.

As a member of a naturalists' expedition to Kirghiz, Sam detached himself, located the Tien Shan tribesmen who hunted the Berkut, and settled down to bargain for one with the local Khan. Outspoken in his distaste for the cruel training methods of the Khan, Sam vowed he would train a Berkut without starving it or seeling (sewing) its eyelids. His determination paid off. The Khan gave him a five-year old female Berkut thought to be dying of a parasitic disease.

From this point, Sam's life with Atalanta became one triumph over near disaster after another. He cured the disease within days of obtaining proper drugs but was refused permission to cross the German East-West border with the bird. With minutes to train time, he found a German naturalist who promised to care for the eagle until Sam could claim her.

Two years passed during which Sam heard only by a postcard and a newspaper report of his eagle. Then, on short notice, the bird arrived in England half-crazed with fear and hate from successive plane trips boxed in a wooden crate. After frantic arrangements, Atalanta arrived at Pwllheli, Wales, where Sam's home faces the sea and the craggy tips of nearby mountains suggest on a smaller scale the Berkut's native habitat.

As a falconer, Sam knew that training must follow the ever-changing character of the bird and the cycle of the seasons. His task was compounded by the sometimes bizarre holiday antics of motorists, cyclists and summer vacationers as the exploits of Atalanta and her mad (so some thought) trainer were noised abroad.

On one occasion she stayed away 29 tense days. Several times she attacked neighborhood pets, with and without provocation. It was then that Sam came across Shep, a Welsh collie he trained to hunt with Atalanta, and herd her safely home to her window-ledge perch when Sam happened to be absent.

David Bruce's book is an absorbing tale for those who relish the dual adventures of man and beast. But a disturbing imbalance exists between the abundant day-to-day detail and a number of omissions. Some things appear too hastily glossed over: for example, Sam's apparent wandering off from the expedition to camp out with the Kirghiz tribesmen. And the fictionalized treatment in the epilogue detracts from the vivid accounts that precede it. Nevertheless, these discrepancies are not enough to damage the reader's involvement with Sam Barnes and his great golden eagle.
—Jane Day

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Smithsonian highlights

Freer Gallery of Art
"Chinese Album Leaves and Lacquer Ware" is a collection of 24 painted album leaves dating from the Sung through the Ch'ing dynasty. Also included are five examples of Chinese lacquer ware that represent the change in style from 1280 A.D. through the late 15th century.

"Japanese Screen Paintings" include bird and flower screens from the Freer collection ranging in date from the late 15th century to the 18th century.

National Collection of Fine Arts
"150 Years of American Drawing (1780-1930)" includes 55 drawings from the collection of John Davis Hatch who is an authority on the works of American draftsmen. Some of the artists represented are Benjamin West, John Singleton Copley and Thomas Sully. Opens May 21.

"John Marin (1870-1953)" is a centennial exhibition of his works, including 157 oils, watercolors, drawings and etchings, organized by the Los Angeles County Museum of Art.

"High School Graphics II" represents the best in high school art in the District of Columbia area. The show includes varied art forms and is on display in the education gallery.

"Graphics '71: West Coast, U.S.A." is a print exhibition of the 25 best graphic artists in California, Oregon and Washington. Originally organized for the annual graphics exhibition at the University of Kentucky, the exhibit will tour the country after its closing on May 16.

"Children's Day, May 8"—a fun-filled day of art experiences for children who may enjoy a "new thing" light show, magicians, puppet shows, treasure hunts and the chance to watch artists, sculptors, potters and flower makers—all day in the courtyard.

Division of Performing Arts
"The Waywardly Wandering Wagonful of Banjo and Jack" features the Smithsonian puppet theater created by the Allan Stevens company. The show is based on the old touring wagons that traveled across the country in the 19th century, entertaining the audience with folk stories and songs. Beginning May 22 there will be three performances daily—Museum of History and Technology.

Folklore Society of Washington Concert —blues and gospel music in the Museum of Natural History Auditorium—May 14. (For further information on tickets, call 202-381-5395.)

National Portrait Gallery
"Portraits by Winold Reiss" is a unique pictorial commentary on the important role black Americans have played in shaping this nation's art. The show includes 11 pastel portraits.

"Henry Benbridge: American Portrait Painter (1743-1812)," is a collection of 45 portraits and 21 watercolor miniatures (see article, SMITHSONIAN, April 1971).

"Along This Way," a teaching exhibition on black-culture exponent James Weldon Johnson (1871-1938), uses portraits, photographs and recordings to tell about the man and his work.

"John Muir (1838-1914)" is a teaching exhibition on the conservation movement in the United States at the turn of the century.

Museum of History and Technology
"Music Machines—American Style" features the music-making machines that have revolutionized the performance, reproduction and dissemination of music in this country. There will be live performances, lectures, recordings and movies shown continuously.

"Poetry of the Body" is a collection of paintings of parts of the body by Dr. Paul Peck. Dr. Peck's paintings are both medically accurate and visually appealing.

"Do It the Hard Way: Rube Goldberg and Modern Times" is a special exhibition of cartoons, writings, sculpture and inventions (see article, SMITHSONIAN, November 1970).

Anacostia Neighborhood Museum
"Exhibition 71" is the third annual event held by the D.C. Art Association and will include works by 36 D.C. artists.

Arts and Industries Building
"Apollo Lunar Module" is the actual landing craft in which Apollo astronauts descend to the moon's surface—the first public showing of the spacecraft.

The Robert H. Goddard Memorial Exhibit includes his 1926 and 1941 rockets and assorted memorabilia.

"Space and Artists" consists of 60 paintings inspired by the space effort. The exhibit includes sculpture, impressionistic and abstract paintings and realistic illustrations.

Museum of Natural History
The techniques in the use of fiber glass in preparing the realistic displays in the Museum are shown in the foyer.

Traveling Exhibition Service
Oklahoma City, Oklahoma—"A New Look at Methods of Energy Conversion" (Oklahoma Science and Arts Foundation, May 1-June 13).
Pine Bluff, Arkansas—"Contemporary Finnish Design by Tapio Wirkkala" (Southeast Arkansas Arts and Science Center, May 15-June 13).
Nashville, Tennessee—"Georgian Country Houses" (Tennessee Fine Arts Center, May 8-June 6).
Corning, New York—"Toledo Glass National III" (May 1-30).

Smithsonian Commons
Luncheon facilities are now open for staff, resident scholars and all members of the Smithsonian Associates. Located in the original Smithsonian Building and open weekdays from 11:30 to 2:00 o'clock, the Commons offers a complete buffet luncheon for $2 upon presentation of a membership card.

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By Patrick Ryan

'To all, to each, a fair good-night' (Marmion) *... Zzzzzzz*

Insomniacs the world over may justly lie awake and ponder why such legions of researchers labor to tell us what we're up to while we're in the arms of Morpheus, but so few seem concerned to tell us how to get there. Electroencephalography charts the hurly-burly of our somnolent cortices, electrooculargraphy tracks any quiver of our soporific eyeballs, every snoring decibel is faithfully tape-recorded, and each rapid eye movement is related to the drama of our dreams and checked against any external displays. Hypnologists thus come to know all about our behavior in dreamland, without unfortunately being able to offer us a guaranteed ticket thereto.

The scientific slumbermakers that have been developed are available only to the relative few: the Russian "Electroson" for hospital induction of electrotherapeutic narcosis, the German "sleep-glasses" which produce siesta through eyelid electrodes, and those Japanese machines emitting soothing, lullaby sounds. But the ordinary man in the wide-awake bed is still left in the watches of his night with no friends but pills and folklore. In consequence, millions of sleeping tablets, oceans of sedatives and niagaras of alcohol slip nightly down human gullets in the hope of achieving chemically induced sleep—accompanied at lights-out by an infinite variety of personal rituals performed in propitiation of Somnus, the god of sleep.

Charles Dickens was among the many Victorians who held that a good night's kip was only possible if the bed were aligned from north to south so that the magnetic currents flowed straight through the recumbent body (although some followers of Islam devoutly flout his theory by ignoring the poles and insuring their righteous rest by pointing their couches toward Mecca). And those folk who believe that humans should sleep on their left sides to avoid insomniac indigestion are counterbalanced by those who consider that they should lie on the right side to take the weight off the heart.

Benjamin Franklin stoically advised that a chill skin was required for a good snooze and accordingly had his windows kept open till the bedroom temperature sank to freezing point. Nobody recorded what Mrs. Benjamin Franklin thought about such arctic conjugality.

Mentally controlled relaxation of every muscle in the body, from the feet upwards, is a much-recommended passport to oblivion. But it can bring naught but soot-bagged eyes to the worrying kind who lie tremulously awake wondering if, once they get everything totally unhinged, they'll ever be able to get the dry bones back in working order again. Reciting poetry seems to work for some with parrot memories, but the less retentive of us can spend sleepless nights racking our brains for the next line. I once knew a young lady who was hooked in adolescence on the rhyming of Sir Walter Scott; forever after, she tried to lull herself to sleep by reciting *Marmion*. Unfortunately, her recall was so consummately total that she would still be flawlessly plodding through the 115th stanza when the sun came up over the gasworks and it was time to get up. Valediction eventually became unavoidable when she turned somniloquent as well and kept others awake long after she herself was in slumber by quoting aloud from the poetic life and hard times of golden-capped Lord Marmion.

Counting sheep jumping over gates is perhaps the most commonly quoted method of self-catalepsy, although there are no official statistics available to tell whether anyone ever found it successful in practice. So far as personal experience goes, I find myself in the same envious dilemma as Charles Lamb when he complained about the poverty of his own dreams as compared with those of Coleridge who "at his will can conjure up icy domes, pleasure palaces for Kubla Khan, and Abyssinian maids when I cannot muster up a fiddle." So far as nocturnal sheep are concerned, my own mind's eye has the utmost difficulty in conjuring up the figure of a single static ewe, never mind mustering whole flocks leaping in single file.

Which leaves me but to lie in the dark and listen, taking what comfort I can from my place in that distinguished company of night owls which includes Edison, Shakespeare, Napoleon, Count Dracula, and all the royal heads of history who lay uneasy because they wore a crown. And I am left savoring the opinion of the ancient rabbis that the decisive distinction between man and the angels is that the latter never sleep.

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